PROPERTY OF
RESEARCH DEPARTMENT
NATIONAL ASSOCIATION OF ACCOUNTANTS

N.A.A. BULLETIN

September
1957

In Three Sections
Section 1

Employing Your Capital Effectively

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A Flexible Cost Basis for Pricing

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Foundry Cost and Production Control

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Cases in Integrated Data Processing

N.A.A. BULLETIN

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This *Bulletin* is published monthly by the National Association of Accountants, 505 Park Ave., New York 22, N. Y. Subscription price, $10 per year. Reentered as second-class matter September 22, 1949, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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A Flexible Cost Basis for Pricing

by ALLEN H. SEED

THE SETTING OF SELLING prices reminds one of the story of the three bears. The porridge can be too hot, too cold or "just right". The trick is to set prices "just right". Our purpose is to consider how we might best go about setting selling prices that will lead to maximum profits and how we might best organize ourselves for accomplishing this task. For purposes of illustration, our industry frame of reference will be a medium-size, hard goods manufacturing company. However, in most businesses, there are two sets of factors that must be considered in pricing. Let us call them cost and market factors.

The Cost and Market Factors

There are several kinds of cost factors, not mutually exclusive but recognizably different. One type consists of easily measurable costs like purchased materials, direct labor, normal factory overhead, selling and administrative expense, financial charges and customer discounts. It should be recognized, however, that there are usually special variations of cost elements in each product which cannot be easily measured. Cost categories involved in such variations include procurement, special tooling, special inspection, special handling, research and development, promotion and administrative costs. Value added by manufacturing should also be considered as a type of cost factor. Products which have a high proportion of manufacturing costs to material can often command a larger margin on sales than products with a low proportion of manufacturing costs. Investment required is another type of cost factor. Different products often require different inventories and fixed investment. Although variations in cost and the investment required are more difficult to measure than processing costs, it is practical to take these factors into consideration in the development of a pricing formula.

Market factors include the consideration of competitor's prices, the size,

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ALLEN H. SEED at the time this article was written was Secretary and Controller of the Superior Separator Company, Hopkins, Minnesota. Since then he has become associated with the San Francisco office of McKinsey and Co., Inc., management consultants. Mr. Seed is a previous contributor to the *Bulletin*.

Example of Calculation of Fixed & Variable Cost & Expense Using Method of Least Squares

(Data in Thousands of Dollars)

Month	Sales Budget	Cost & Expense Budget	Sales Times Cost	Sales Times Sales
January	$ 424	$413	$175,112	$179,776
February	463	430	199,090	214,369
March	786	658	517,188	617,796
November	431	420	181,020	185,761
December	401	386	154,786	160,801
Total	$6,781	$6,066	$3,607,196	$4,091,071
Number of Months			12	12
Extensions			$43,286,352	$49,092,852
Total Annual Sales X total annual cost			41,133,546	
Total Annual Sales X total annual Sales				45,981,961
Difference			$2,152,806	$3,110,891

Variable cost and expense equals $2,152,806 ÷ $3,110,891 which equals 69.2% sales.
Fixed expense equals total cost and expense less variable cost and expense:
$6,066 less (69.2% X $6,781) equals $1,374.

EXHIBIT 1

health, life expectancy, and specialization of the market, and the usefulness and appearance of the product. The effect of each of these factors can be measured with a certain degree of reasonableness.

Developing the Formulas

Application of cost factors to pricing is sometimes made to seem deceptively simple. In business generally, it would seem, there is a natural tendency to emphasize a pricing formula based on percentage of margin on sales, which will magically produce the right price, or on the selling prices of competitor's products. It would seem to be more realistic, however, to use a series of formulas rather than a single formula for each product in order that the factors which are difficult to measure may be taken into consideration. Such a series of formulas is described on the following pages.

The first step in developing a formula is to determine the normal relationship between sales, and costs and expenses. Since the formulas will be used to price new products which will be sold in the future, it is important, wherever possible, to forecast sales, costs and expenses, rather than to use historical figures. In this case, pricing formulas are determined at the same time that the budgets are prepared, and are also revised whenever the budget is revised.

Costs and expenses should be broken down between their fixed and variable components. This can be done with a scatter graph, by analysis of each component of cost and expense or mathematically by using the method of least squares. The method of least squares may be preferred. It avoids argument

as to just how the cost line should be drawn through the dots or as to just which expense items are fixed and which are variable. The method of least squares also has its shortcomings. It is important that the price and cost levels be comparable throughout the period analysed. Varying relationships of sales to production can also distort the figures. An example of the calculation of fixed and variable expense using the method of least squares is shown in Exhibit 1.

The next step is to determine the projected relationship of standard variable manufacturing and material costs of products sold to sales. Let us assume for the sake of our example that standard cost will be 60 per cent of sales, on an over-all basis.

Following this it is necessary to determine the sales volume level that we intend to use for pricing. This level might be the same sales volume that is shown in our budget if there are no major abnormalities expected in the succeeding year. However, if the industry is in a depressed state or if a substantial number of new products are expected to be introduced, it would be well to agree on a normal level of sales which should be used for pricing purposes. For our example, then, we will assume that, even though we have budgeted $6,781,000 worth of business in the succeeding year, because of new products and present fractional utilization of our facility, that $7,500,000 would more realistically reflect our level of business after these new products are introduced into our line.

Using this volume, our 60 per cent relationship of standard variable costs to sales, and the percentage relationship between fixed and variable costs developed in Exhibit 1, we are now able to draw together, in the form of an over-all projection, the data which will underlie our series of pricing formulas, developed below:

	Amount (000's Omitted)	Per cent to Sales
Sales, less returns	$7,500	100.0%
Cost and expenses:		
Standard variable cost of products sold	$4,500	60.0%
Other variable expense	690	9.2
Total variable expense	$5,190	69.2%
Fixed expense	1,374	18.3
Total costs and expense	$6,564	87.5%
Profit before taxes	$ 936	12.5%

Having determined in this way the percentage relationship of fixed expense to sales, we may construct a series of formulas, each one supposing a different relationship of standard variable cost to sales instead of the 60% average. These

will provide a range of percentages of profit to sales, as follows:

	Percent to Sales				
Sales, less returns	100.0	100.0	100.0	100.0	100.0
Cost and expenses:					
Standard cost of products sold	72.5	67.5	62.5	57.5	52.5
Other variable expense (from above)	9.2	9.2	9.2	9.2	9.2
Total variable expense	81.7	76.7	71.7	66.7	61.7
Fixed expense	18.3	18.3	18.3	18.3	18.3
Total costs and expenses	100.0	95.0	90.0	85.0	80.0
Profit before taxes	None	5.0	10.0	15.0	20.0
Formula percentage to apply to standard cost to arrive at net price (% Sales ÷ Standard cost)	1.38	1.48	1.60	1.74	1.90
Formula percentage to apply to standard cost to arrive at list price assuming 20 & 5% trade discounts (Net price formulas ÷ 76%)	1.82	1.92	2.11	2.29	2.50

Modifying the Answer by Supplementary Cost Factors

Now we have five separate formulas or markup factors to apply to individual products on a judgment basis. Each factor will give us a different selling price based on projected average costs and expenses with different margins. However, these prices are strictly based on cost, and measurable cost and expenses with different margins. The answers provided by these formulas obviously do not take into consideration variations in operating costs, value added by manufacture or investment required. It is suggested, therefore, that the variations be either formally or informally considered and that a final price be selected which will depend on the factors involved.

Return on investment can be worked in at this point. For example, suppose that your company has set a target of returning 25 per cent on the assets employed in the business before taxes. You normally turn over your capital twice a year. Then your average margin on sales would necessarily have to be 12.5 per cent (25% ÷ 2 = 12.5%). Suppose further that you are faced with the problem of pricing a new product which requires slightly more capital than the average, involves a higher ratio of manufacturing costs to material costs than the average and contains certain special handling and promotion costs. In this case, you would select a pricing target which would be in the 15 to 20 per cent range. Conversely, if the cost of your variations was below average, your pricing target would be below average.

Another variation of this approach which has been found to be especially helpful in pricing repair parts, is a "split" type of formula. This formula is particularly useful in pricing a large number of relatively unique items, none of which contribute much sales volume but which have varying proportions of value added by manufacturing. Let us assume, for example, that about half of your aggregate standard costs consist of manufacturing, that you want an overall margin of 20 per cent of sales on this business, and that your trade discounts for repair parts are the same as they are for whole products. You might, in this case, establish a pricing formula of three times manufacturing costs and two times material. The average multiplier would of course be 2.50 which would give you a 20 per cent margin on sales. However, on items with a high conversion cost and low material cost, the margin will be higher than 20 per cent. Purchased items will contribute less than a 10 per cent margin.

Modifying the Answer for Market Factors

Costs tell only half of the story. Computed selling prices must be weighed against both the long and short-term capacity of the market. One way of measuring the capacity of a market is through market research in a test area. You might select alternative selling prices and, by interviewing a representative number of prospective customers, determine how many customers indicate that they would buy at each of these prices. By multiplying projections of these quantities by your fixed expense and margin in each product, you can determine which selling price will produce the greatest contribution to profit. The cost of the capital required should be deducted from this contribution in order to determine which selling price will provide the greatest net contribution. Another way of obtaining the same information is to actually test-sell your product at different prices in comparable non-competitive markets. Each of these methods of determining the most profitable selling prices is obviously time-consuming and expensive. As a practical matter, these methods must necessarily be limited to a few items which have a large potential sales volume.

Competitors' price lists are certainly helpful when pricing products which are similar to those offered by competitors. However, it should be recognized that two products are seldom exactly the same and that, irrespective of the price you set, it is unlikely that you will get all of your competitor's business or he yours. Also prices must bear a reasonable relationship to the usefulness and cost savings which are offered to the customer. Because of the addition of an appealing gadget the price of a product may be increased far beyond the

actual value added by the particular accessory. Nevertheless, it is fairly safe to say that a product selling for $10 has to look like $10 worth of product in the eyes of the customer. Care on this point can avoid embarrassing mistakes, particularly when pricing repair parts. Matters pertaining to the size, degree of specialization and permanence of the market must also be considered.

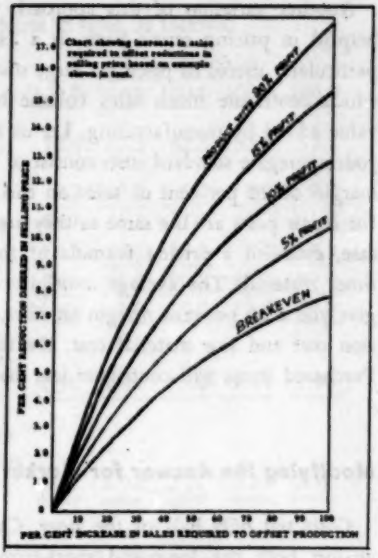

EXHIBIT 2

Whether market factors are formally weighed through the use of a check list or informally considered by the person who is responsible for setting selling prices, it is evident that good judgment is the most important prerequisite for profitable pricing. Underlying this judgment, of course, a decision must be made as to whether to price in terms of "all that the market will bear" or in terms of a "reasonable margin over and above the cost." The former philosophy often leads to greater immediate advantage at the expense of long-range growth.

Calculating and Charting Effects of Price Changes

In general, there would appear to be two types of occasions which warrant changes in selling prices. The most common of these is a blanket increase which simply passes on to the customer the upward spiral of costs. Such an increase usually applies across the board or to large classes of products. The second type of price change is usually made in order to increase the profit contributed by a single item or group of items. These changes are more difficult to deal with than blanket adjustments. They usually reflect changes in the nature of the product, changes in the character of the market or errors in the original pricing.

Although hunch, judgement and trial and error cannot be entirely avoided when decisions are made in regard to individual items, it is possible to study the economics involved by comparing the profit margin in a specific product to its sales volume. For example, let us assume that we have a class of products

which are priced to produce an 18.3 per cent contribution to fixed expense and a 10 per cent profit before taxes. Let us further assume that our annual sales of this class amount to $1,000,000. Using the data assembled for our pricing formula, we might then perpare the following tabulation:

	If sales were increased by (000's omitted)			
	0%	10%	25%	50%
Net sales volume	$1,000	$1,100	$1,250	$1,500
Variable expense @ 71.7% net sales	717	789	896	1,076
Contribution to fixed expense & profit	$ 283	$ 311	$ 354	$ 425
Cost of additional capital (@ 10% of additional capital. Computed as 25% of increase in net sales)	None	$ 3	$ 6	$ 13
Contribution less cost of additional capital	$ 283	$ 308	$ 348	$ 412
Current contribution to fixed expense & profit	$ 283	$ 283	$ 283	$ 283
Additional contribution to fixed expense & profit	$ None	$ 25	$ 65	$ 129
Per cent price decrease equal to additional contribution to fixed expense & profit (additional contribution ÷ net sales)	None	2.3%	5.2%	8.6%

In this example, a 10 per cent increase in unit sales and a 2.3 per cent price decrease would produce the same dollar contribution to fixed expense and profit as was realized before these changes were made. A 25 per cent sales increase would be required to offset a 5.2 per cent price reduction. A 50 per cent sales increase would be required to offset a 8.6 per cent price reduction. This calculation can be similarily made for products with various margins and can be plotted on a chart such as is illustrated by Exhibit 2. It can also be applied to effects of price increase and volume decrease.

Such chart, showing the increase in sales required to offset a decrease in selling price, is a valuable guide for pricing decisions. It focuses attention on the economics involved and tends to confine the risks of adjusting prices on feel or hunch. However, the limitations of this technique should also be recognized. Averages have been used to determine cost in many instances. Someone must

determine how much additional business a contemplated decrease in selling price will provide.

Administration of Pricing

Ideally, a product should be priced before it is designed. It is amazing how much money can be spent on the development of a new product which is later found to be unprofitable. For this reason, it is strongly recommended that the proposed selling price and an estimated annual sales volume be made part of each engineering project authorization for a new product. Since the sales organization usually has the responsibility of selling a certain quantity of product at a certain price, it would seem that it is the function of the market research or sales organization to make the initial determination of price and volume figures.

The cost accounting staff has the responsibility for furnishing the information needed to work back from proposed selling prices and profit targets to cost figures. Engineers also need tools to estimate rough costs in order to design within the specifications of the project authorization. Because of a tendency to overlook certain elements of cost, such as payroll taxes, insurance, handling and other elements of overhead, it is important that cost-finding tools be developed or reviewed by a qualified cost accountant. After a product is designed many other functions usually get into the act. Among other things, it is usually necessary to prepare bills of materials and to determine production and inventory requirements, cost and source of materials, tool designs, manufacturing methods and time requirements, advertising and promotional programs. The selling price and cost estimate for the product should be redetermined at this point.

Using the information that has been assembled by other functions in the business, it is a cost accounting function to determine the cost of the product and suggest a range of selling prices. It is then the sales organization's responsibility to select the final selling price. Because cost accounting is a staff function, it should be emphasized that a cost accountant's job is to furnish facts. Sales, a line function, should set prices. Management should review the activities of both to assure that prices are based on reliable facts and are such that they will lead to maximum profits.

Nine Viewpoints on a Natural Fiscal Year

By JOHN T. O'MALLEY

THESE PARAGRAPHS REPORT a group discussion of a fictitious corporation which is reviewing the reasons why it changed to a natural business year. The supposed dialogue is intended to be representative of the reactions likely to be found when a company has had some experience with this arrangement.

Mr. Moderator: We have gathered here qualified representatives of our company and a few interested outsiders to give us their opinion on the natural fiscal accounting year which we have had in effect for the past two years. As you are called please limit your discussion to those points which you believe primarily concern your phase of our business. Will you start, Mr. President?

Mr. President: We have noticed that there is a definite seasonal cycle to our business. We are, of course, very anxious to know the results of our activities over this period. We want a sound basis for gauging our progress and planning for our future operations. We feel we can do this best from the information supplied from reports prepared on our natural business year. Research and development, a most important segment of our potential growth, can better be planned in the light of the results obtained from a natural fiscal period. We feel that the natural year is a much better guide since it does not include part of the end of one business cycle with part of the beginning of the next cycle, as the calendar year does.

Under our present method the less-active period, at which we close the year, gives us a wonderful opportunity to collect our thoughts, catalog them and put many of them into effect. We can regroup our forces for more effective action. We can recheck our selling prices to see if they are in line with costs and competition. We can establish our sales quotas. We can set production schedules to permit a more evenly balanced work force and work week. We are now able, during this breathing spell, to review our overall policies and make changes if necessary.

JOHN T. O'MALLEY is Assistant Treasurer and Office Manager of Wain-Roy Corporation, Hubbardston, Mass. Before joining this company he was office manager of Jennings Brothers Air Service. He has been Program Director and Publications Director of Worcester Chapter. Mr. O'Malley authored an article in the May 1956 issue of the *Bulletin*.

Mr. Moderator: Thank you, Mr. President, for your comments. Next, we will call on Mr. Treasurer.

Mr. Treasurer: Our annual published report goes to our investors, banks, credit and financial institutions. We have found that it is at the end of our natural business year that reports show us at our best financial condition. We made a study of the operations of our business two years ago and we noted that there is a recurring point each year at which sales, production and general activity are at their lowest points. We found that it is at this period that our inventories are at their lowest point. Our receivables are smallest and we are in a more fluid condition. If there are any notes or loans outstanding we usually pay them off before the close of our fiscal period since the money is usually more available. This greatly improves our current ratio.

The closing date which this study indicated coincided with the recommendations for our industry also indicated by information available from the National Business Year Council and Dun & Bradstreet and was in line with influencing factors suggested by The American Institute of Certified Public Accountants.

You may recall, Mr. Moderator, that we did have to amend the by-laws of our corporation to effect this change in our accounting period. We also changed the date of our annual stockholders meeting to bring it closer to the end of our fiscal year. We consulted our law firm and our external auditors in order to comply with the legal and accounting procedures necessary to accomplish this change.

Right after the completion of our year-end reports, we strive to bring our cost information up to date. New standards are set for material, labor and manufacturing expenses. Changes made when we establish new costs are used for the purposes of determining our cost of sales for future profit and loss statements. We can better prepare our financial and operating budgets for the coming year. All department heads can devote more time to preparing their budgets for the new year since their work load has let up sufficiently to permit them to make a careful analysis of their requirements for the budget for their department. In general, this is the best time for us to coordinate our financial plans, decide how much inventory we can invest in and decide how much money we will need to borrow to carry us over until the business cycle picks up enough momentum to reverse the stock-piling trend.

Mr. Moderator: Thank you, Mr. Treasurer, for a most comprehensive report. Now, let us hear from the man who supervises most of the paper work, Mr. Accountant.

Mr. Accountant: When we first decided on a fiscal year it appeared to me that it was done primarily for my benefit. We had been using a calendar closing which greatly increased the work load during a period when many other reports also had to be prepared. The earnings of each employee had to be totaled and proved out. The W-2 earnings record were then prepared and forwarded to all employees. Form W-3 Reconciliation of Income Tax Withheld from Wages, was completed. The fourth quarter report, Form 941, Employer's Quarterly Federal Tax return for Withholding and F. I. C. A. taxes had to be prepared. The fourth quarter record for the state, covering the employer's contribution for employment security together with the Federal report Form 940, Annual Federal Tax Return of Employers for the Federal unemployment tax had to be completed and forwarded to the proper governmental agency. In addition, there were Form 1099, United States Informtaion Return for the Calendar Year, and Form 1096, United States Annual Information Return used to summarize Forms 1099. There are other reports required which are also time-consuming. When we adapted a fiscal year other than December 31, you can see that this took considerable pressure off us in the preparation of these governmental reports.

Our inventories, being lowest at the close of our fiscal year, can be costed much more rapidly because of the smaller number of items involved. We can now help prepare schedules for our external auditors, which lessen their work, reduce their fees and speed up the completion of their audit.

We do require some new types of accruals, especially for real estate and personal property taxes which are on a calendar year basis. It is likewise a fact, Mr. Moderator, that we have occasionally to make up some reports based on a calendar fiscal year period, but these are minor and offer little extra effort in compiling the necessary data. We also found that the first period after we started to use the natural closing period we had to adjust our previous accounting period in order to compare the results of the two years. We were able, with a little work, to shorten the preceding period to agree with our new period. When two full years are involved, of course, it is just as easy to compare fiscal years as calendar years.

Mr. Moderator: Thank you, Mr. Accountant, for your viewpoint on this subject. The next person that we would like to hear is our plant superintendent.

Mr. Plant Superintendent: In the plant we have always disliked taking inventory on December 31. We are always just beginning to enter our busy period at that time and do not relish the interruptions necessary to count the fiscal inventory. We are usually working more than 40 hours a week out in

the plant in December. This means that it was very expensive to count the inventory at that time, since most of it was done at overtime premium rates. There usually was a considerable amount of Christmas and New Year spirit still running through the shop and it was a little difficult to convey to the men the seriousness of accurate and thorough counting.

Now we are using a natural business year ending on October 31. Since we are then in a slower period the men are not working at overtime pay rates. We can not only count more accurately but we can make use of more people who have a better knowledge of the value and description of the items. Our production is not appreciably interrupted during our fiscal closing period, which relieves us of many of the headaches we used to have when we used a calendar year closing, such as late deliveries and possibly lost sales.

Mr. Moderator: Thank you, Mr. Plant Superintendent. Now, what about the fellow who does most of the manual work involved, especially when it comes to actually counting the items for inventory? Let's hear from him.

Mr. Employee: We sure like the fiscal year closing, although we do miss the overtime pay. There is a general let-up just before Christmas which carries over into the New Year. Counting inventory on December 31, was "for the birds," since it dampened our spirits. Up north, where our plant is located, we often found ourselves literally out in the cold counting items in an outside storage area. This usually left us with cold feet and a healthy dislike, to put it mildly, for the "front office" who wanted these "darn" things counted in the first place. Besides, fall is a better time than winter for looking over the pay rates and reopening labor contracts.

Mr. Moderator: We have heard, so far, from persons connected with our company. How about considering the outsiders who have a hand in this matter. It is the external auditor who reviews our operations and prepares our certified financial statements. What can you add, Mr. Auditor?

Mr. External Auditor: Although my connection with your business is that of an independent public accountant, I am highly pleased that the company has picked a year-end closing other than December 31. We can do the audit better when we are not rushed with the usual end-of-the-year tax returns. We find that we can maintain a more balanced staff of employees when our work is spread throughout the year. We can eliminate many of the part-time people we have to add during the busy period right after December 31. Our regular people have more experience and knowledge of your business from previous audits so that the possibility of mistakes and omissions is greatly lessened.

We find that we can more easily verify the correctness of the count and accuracy of the value of the inventory because of the smaller number of items to be checked since it is at its lowest point at the end of the natural fiscal year. We get more positive results in the way of replies to our requests for vertification of statements of accounts receivable and accounts payable for the good reason that your customers and vendors often have more time to help us when they are not so rushed preparing their own year-end reports.

Mr. Moderator: We are glad to see that we are helping to maintain a more even economy by enabling you to keep more of your employees busy throughout the year. Thank you for your part in this discussion. Let us find out how the fiscal closing is regarded by the Internal Revenue Service.

Mr. District Director: We have no objection to a fiscal year closing, providing all government regulations are complied with. We allow such a change providing it is desired because of sound business reasons and not for any tax advantage. We do like to have Form 1128, Permission for Change of Fiscal Year, filed 60 days before the end of the new accounting period. This helps to avoid any later misunderstandings as to the reasons for the change. We now allow under the Internal Revenue Code of 1954, a change in the fiscal year without our permission when the company has made no change in its fiscal year during the past five years. The only exception here is that the new period must be within three months before or after the old closing date, subject to some minor technical considerations. The income is computed for the shorter period and then projected on an annual basis. The tax due is then based on the annual projection but for that fraction of the year which the short period covers. We do not, of course, allow any tax advantage that may accrue because of the short period. You may apply to the Commissioner for relief if the tax, computed on an annual net taxable period, is prorated for the short period and this shows that the tax for the short period should be less. This means that there may be the possibility that the short period might prove to be the one ordinarily more profitable, and, if so, the income for this short period projected for the full year may mean higher taxes when annualized, which might not otherwise occur if the old fiscal period was used. We would like to call to your attention that, in carry-backs or forwards of net operating losses, the short period is considered as one full year under the Internal Revenue Code.

Mr. Moderator: Thank you, Mr. District Director, for showing us the tax angle. We are fortunate in having one of our outside directors present. He can give us a viewpoint not limited to our company.

Mr. Outside Director: I would like to inject a word of caution into this discussion. If your company should be a member of one of the industrial groups which prepare data by using a specific year-end basis and your year ends at a different period than the one used by the group, this does mean extra work in changing over your records to be used in any summary prepared by the group. Also consolidated statements are becoming much more common, since many industries today are trying to diversify products. Some companies buy other companies which manufacture, service or sell a product completely alien to their original line. For these companies it would seem that for the consolidated statement it is best to use the fiscal year of the parent company. There are also certain city and state requirements and approvals needed which I assume you have looked into and complied with. Another point to keep in mind is the regulations of the Security and Exchange Commission which may affect your company. I also understand that the Interstate Commerce Commission has very strict requirements on those businesses which come under its jurisdiction. However, from what I have seen and heard here today, it appears that you have made a good move in changing to a natural fiscal business year.

Mr. Moderator: Thank you, Mr. Outside Director, for calling our attention to points which help us understand why everyone does not jump immediately on the bandwagon for a natural business year other than December 31. Now we have a final viewpoint, that of one of our investors.

Mr. Investor: I like a fiscal closing, especially one that comes before the end of the calendar year, since it usually enables me to know that much sooner what dividends I may expect on my investments. I also realize that dividends declared after the financial statements are prepared are based on more sound reasoning than those for interim periods when the value of the inventories often are estimated and not subject to an outside audit. The company which gives me a financial report on a fiscal year other than December 31 gets more of my attention than the company whose report is received about the same time as several others which use a calendar year period.

Mr. Moderator: Thank you, Mr. Investor, for the final viewpoint in this discussion. I do not feel that we need to summarize the view points expressed here today with varying particulars. They all tend in the same direction. However, I do believe that a report of what has been said here today should be reproduced in its entirety and copies submitted to each of you.

Look Before You Lease Industrial Equipment

by ROBERT C. KUENHOLD

FOR MANY YEARS, leasing as an alternative to outright purchase of capital equipment has been commonplace in certain industries such as shoe machinery, construction equipment and office machines. More recently the practice has been put into such widespread use that most every manufacturer of capital goods is confronted, sooner or later, with a prospective customer who demands to know whether he can lease products as well as buy them. Several prominent machine tool manufacturers, in an industry that for years has adhered to ultra-conservative marketing practices, have given additional impetus to the much discussed lease alternative by actively publicizing a variety of plans for the acquisition of new machines.

The theory of leasing of industrial equipment is an interesting and highly complex subject. However, it is not within the scope of this paper to evaluate the broad aspects of leasing industrial machinery but, rather, its purpose is to set down some of the recognized facts and to weigh those which appear to be most pertinent to a solution of the basic problem—to lease or not to lease our product. This report is confined, therefore, to a consideration of the two questions which represent the major considerations upon which to base a practical policy on leasing. What do our customers gain or lose? What do we gain or lose?

What Do Customers Gain or Lose?

Let us consider carefully our customer's desires and preferences. It would be wrong to assume that because he has always purchased he will continue to do so. Progressive businessmen are engaged daily in the examination of methods and procedures. Eventually the question is asked, why do we purchase capital equipment? Why don't we lease it?

The relative attractiveness of equipment leasing over outright purchase is

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ROBERT C. KUENHOLD is Assistant Treasurer and Comptroller of the Taylor-Winfield Corporation, Warren, Ohio. He has been associated with this company since 1952. Prior to his present position Mr. Kuenhold was with the American Appraisal Company, Milwaukee, Wisconsin, and in public accounting in Willoughby, Ohio. He has been in the accounting and financial management fields since 1936.

derived from a peculiarity of our Federal tax laws. Rentals are deductible from income as paid, whereas payments for equipment purchased are deductible only over the useful life of the machine, which is highly speculative and varies widely with technological obsolescence and conditions of use. It is only since 1954 that alternatives to a straight-line write-off of the asset cost, i.e., the declining balance and sum of the digits methods, have permitted a higher rate in the earlier years of the asset's life. Even on this point, however, it is important to note that the tax advantage of rental deductions over depreciation deductions is due to the incidence of time and must realistically be recognized as a temporary advantage, a tax deferment rather than a tax savings. The deferment of taxes provides additional cash and it is the glitter of this cash which first attracts the eye of the prospective lessee.

The evaluation of a possible cash advantage to be gained through leasing as compared to other methods of acquiring production machinery must, of course, be made by our customers, themselves, with full consideration of their individual financial circumstances as related to the most economical investment of their working capital. It should be recognized that the total dollar outlay required in leasing is usually higher than any other method of acquiring equipment. A typical five year lease, for instance, would require total rental payments ranging from 140 per cent to 180 per cent of the cash purchase price. A gain may be apparent through more profitable employment of funds, which would justify the higher financing cost, but a net long term gain or loss due to leasing cannot be presumed without absolute knowledge of the facts of the case. There may be an advantage to one customer and a disadvantage to another.

A possible approach to this problem might be the careful preparation of a comparative cost study by the company involved, recording the key factors, both tangible and intangible, which must be considered. However, the necessary inclusion of such intangible factors as cost of capital and annual loss in value emphasizes the speculative nature of a cost comparison. Attempts to project earnings on capital freed by leasing are equally nebulous because of the many uncertainties to be considered.

There are other possible advantages to be realized by leasing which may be significant to a varying degree. Normally, they are of secondary importance. Detailed discussion of these possibilities is omitted here because of absence of common application. However, it is necessary to concede that, under appropriate conditions, a combination of these or other possible advantages would have sufficient substance to merit major consideration. Those most often cited are:

1. Leased equipment does not increase the investment in fixed assets appearing on the balance sheet.

2. The risk of technological obsolescence may be avoided.
3. Write-off may be completed over a period of known use which may be shorter than the depreciable life of the asset.
4. Leasing facilitates trial before purchase.
5. Replacement of older, inefficient machines may be accelerated.
6. Cost accounting methods and records requirements may be simplified.

There are three primary disadvantages of leasing which cannot be overlooked. First, the cost of leasing may be too high. Rates are set to provide a manufacturer with his normal profit in addition to a reasonable return for the use of capital supplied. Next, there are certain prerogatives of ownership which must be surrendered when leasing. If a company desires to have complete freedom to relocate, alter, mortgage or sell its equipment at any time, acquiring machinery which legally belongs to someone else may impose severe restrictions on the operation. True ownership often involves more than pride. Some owners may even value their right to abuse their property! In any event, the prospective lessee should examine the small print restrictions which may appear in the lease. Third, and in no sense least in importance, is the fact that tax uncertainties involved in leasing, particularly if a purchase option is contemplated, provide certain pitfalls which could ultimately wipe out the anticipated gains to be achieved through leasing. If either the terms of the lease or the implied intention of the parties is susceptible to interpretation as a conditional sales contract, the tax deductible feature of rental payments could be lost. There is no unanimity in the Tax Court decisions dealing with the subject and most leases fall into a twilight zone as to tax consequences. A prudent lessee must seek competent legal and tax counsel before he enters into a lease agreement.

What Does the Seller Gain or Lose?

Enthusiasm for leasing, as opposed to selling the product, is considerably less prevalent among manufacturers than among customers. The former are used to exchanging their product for an agreed value in cash. The capital invested in the manufacture of a machine is reimbursed upon delivery of the machine and collection of its sales value. This capital turnover, which generates earnings upon each turn, is completed in a reasonably short period of time. No manufacturer would wish to disturb this preferred method of operation unless there were adequate rewards for doing so—or unless his customers demand it. Lease plans have been offered by many manufacturers as an inducement for their customers to acquire new facilities for expansion or moderniza-

tion of their plants. Several well established machine tool builders, for example, have coupled their lease plans with aggressive sales promotion. Much interest has been stimulated and leasing has been heralded as a new marketing tool for expanding sales volume. No manufacturer is adverse to widening the market for his product, so an aid to this end is worthy of consideration.

Upon further analysis, though, certain limitations become apparent. Although the market may be broadened to the extent that machines are leased to customers who cannot or will not purchase, the basic demand or need for new machinery cannot be altered by the use of the lease. There appears to be little doubt that the introduction of leasing has stimulated additional current production, but it is not clear to what extent this additional volume has been borrowed from future years' production. Nor is it certain that the manufacturers who have pushed their lease programs have not lost potential sales. Unless a customer leases two machines as an alternative to purchasing one, there is no real gain to be realized in units delivered. The lease may be, therefore, merely a different avenue to the same sale.

The leasing manufacturer can look forward to the influx of rental income. Because the total payments to be received under a lease contract will exceed the cash selling price, sales revenue per unit shipped will be increased. Some manufacturers might consider this deferment of their income over the term of a lease to be advantageous, in that it would level out their peak years. Another possible advantage is the prospect of receiving "insured" rental income in future years. The contemplation of rental annuities may be very attractive to a manufacturer who is subject to violent dips in sales volume.

Most manufacturers do, however, prefer to sell their product. Even those who are most enthusiastic about the possibilities of leasing are cautious about declaring how far they will go. They seem to agree that only a limited volume of leasing is desired. This is due to the several disadvantages and uncertainties involved in handling leases. The chief disadvantage may be the cost of financing. Unless this burden can be passed along to a financial institution or to a leasing intermediary, the manufacturer, himself, must provide the capital to produce the facility and to "carry" his customer over the term of the lease. The diversion of working capital into a swelling inventory of leased equipment may entail a severe strain upon his financial resources.

Another important problem is the method of reporting rental income for tax purposes. Herein lie many uncertainties. What costs are to be applied against this income? Depreciation of the leased equipment is a logical charge but what rate is proper? The lease may be written for a basic period but its ultimate duration, beyond the non-cancellable period, is indeterminate. How

do we estimate the useful life of a machine which will be operated at a distant location under conditions beyond our control? Most experts agree that lessee-operated equipment will depreciate at a faster rate than the same equipment operated by its owner. However, the Internal Revenue Service has made clear its position that, while it has no desire to obstruct the practice of leasing, it "cannot be party to a device permitting unwarranted acceleration of the tax write-off of leased equipment." The question is, what depreciation rate for leased property is reasonable? An answer to this question will be provided ultimately, but at present it is an unknown factor.

Closely related to the factors of depreciation and obsolescence is the problem of disposing of used equipment for which the customer has no further use. Sales managers have been known to wake up in the middle of the night screaming at the frightening apparition of an army of used machines marching home! This emphasizes the important fact that some types of equipment are so specialized to the needs of the user that they could not be supplied on a rental basis except on a very long-term lease. The degree of convertibility to diverse usage and the cost of conversion provide natural restrictions on the practical application of leasing. This limitation, unfortunately, is not always understood by the customer.

Another potential source of grief for the manufacturer would be servicing leased equipment. Although terms of a lease normally specify the lessee's responsibility for ordinary service and maintenance, the difficulty of enforcing proper standards on the lessee would be very great. Good maintenance practice protects an owner's investment. A lessee has little investment to protect and, consequently, his concern with proper care may be lessened. It is important for a manufacturer to have his equipment performing properly at all times and having leased equipment would multiply service requirements to insure this. In the event of customer dissatisfaction, the enforcement of the terms of a lease would be very costly, if not completely impracticable. The customer's bargaining position is strengthened because of his smaller investment. This raises the prospect that leasing equipment will increase the cost of maintaining customer good will.

An additional disadvantage of a leasing program might be clerical and record keeping requirements. Still another might be the costly involvement with various local tax, insurance and legal problems.

What Will Be the Future Role of Equipment Leasing

There are few, if any, general conclusions to draw. It is significant to note that an advantage for the user of leased equipment is more than likely to be

an ipso facto disadvantage for the manufacturer who, therefore, takes steps to protect himself.

Consider, for instance, the important factor of risk of obsolescence. This is a very real but indeterminate hazard which is normally associated with ownership. The protagonists of leasing claim this risk can be avoided or minimized by the use of equipment leasing. The manufacturer, on the other hand, is unwilling to assume this contingent liability, so he includes this element, justifiably, in his rental determination. Therefore, the risk cannot be eliminated by leasing; its cost must be borne by someone. Unfortunately, an equitable basis for sharing indeterminates has not yet been worked out.

Much has been written of the intrinsic value of equipment leasing as a method of advancing industrial progress. A net gain to our society is envisioned through a more rapid rate of addition of new capital equipment to our growing economy. There can be serious doubt that equipment leasing would appreciably advance progress toward that goal. In addition, there are other broad economic consequences which might follow a large scale shift of ownership from individual users to manufacturers, or to leasing intermediaries. The separation of ownership and operating responsibilities, the shifting of investment burdens, and the realignment of tax values are a few of the consequences of property leasing which could have a pronounced effect on the industrial economy. It seems clear that a complete revision of our income tax treatment of capital goods investment would be a much more sound method of achieving and preserving the maximum rate of technological progress that is prerequisite for enduring prosperity.

What of the future of industrial equipment leasing? Will it wax or wane? I am convinced that, while attitudes of individual manufacturers and users will remain diverse, experience will prove that leasing can be practical and mutually beneficial under some circumstances but impractical and wholly undesirable under others. Perhaps, with the passage of sufficient time, some of the uncertainties now present will be eliminated, so that a manufacturer and his customer may agree upon conditions that are propitious for leasing. Thus restricted by enlightened selection, leasing will assume its proper economic role as a secondary alternative to outright purchase.

How We Practice Integrated Data Processing

by MATTHEW R. PARISI and JOHN McPEAK

IN RECENT MONTHS integrated data processing has received a great deal of attention. Not so much, however, has been written about practical application of this subject. This paper will present a case history of such an application, including problems that were encountered during installation.

Security Steel Equipment Corporation is a manufacturer of metal office equipment. In the past decade there has been an overwhelming change in the office furniture market from wood to metal and Security Steel, together with the rest of the metal office furniture manufacturers, has met this ever-increasing market vigorously. New product lines have been developed, a rainbow of colors and an assortment of grained finishes were added to each line of products. However, our paper processing methods failed to keep pace with our technological improvements. We were operating under an antiquated job order cost system, our procedural framework outmoded and our customer billing slow.

Selection of Equipment and Initial Application

Two courses of action were formulated. A standard cost system would be installed and all of our office paperwork procedures would be reviewed with an eye toward integration. Our discussion will be limited to our order and billing review. Our first step on the road to integrated data processing was to purchase new, high speed office equipment. Much time was spent examining literature, attending demonstrations and visiting plants utilizing automatic office equipment. A choice was finally made in favor of the "Programatic Flexowriter". Two of these common language machines were purchased for the order and billing department. One machine was to be used for preparation

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MATTHEW R. PARISI is Manager of the Systems and Procedures and Tabulating Departments of Security Steel Equipment Corporation, Avenel, New Jersey. He joined Security Steel Corporation in 1953 and has served in managerial capacity in Payroll and Order and Billing prior to his present position.

JOHN McPEAK is Manager of the Cost Department of Security Steel Equipment Corp. Mr. McPeak was previously employed by Johnson & Johnson as Cost Supervisor and Plant Accountant for six years.

of the order and the second machine would provide for the billing of these orders upon their shipment. The Flexowriter is capable of reading either punched tape or edge-punched cards and typing or punching what is read at speeds in excess of one hundred words per minute. In addition, the machine can be programmed to punch into one or more separate tapes simultaneously, with complete or selective information. This information can be processed at a later date on another Flexowriter or converted into tabulating cards at the rate of one thousand columns per minute for accounting machine handling.

Our initial system involved typing the sales order manually as in the past. However, in so doing, we produced a by-product tape containing the complete information typed on the order. This tape was filed in the billing section awaiting notice of shipment. When notice of shipment was received from the traffic department, the tape was pulled and was used to activate the second unit of the purchased equipment to reproduce the customer's invoice. Through proper programming in the tape, the billing clerk was able to select information for automatic typing, inject variable information manually (e.g., quantity shipped and invoice date) or skip portions of the tape entirely, when partial shipments were made. This initial use of the equipment showed immediate results in accuracy, increased speed, and appearance in regard to our billing procedure, without added work in any other area of the department. At this point our initial objective had been accomplished.

The Integration Takes Place

This, however, was not integrated data processing. We had merely added the speed of automatic tape reading typewriters to our otherwise cumbersome system. Attention was now turned toward new methods of accumulating order and sales analysis data as a by-product of the new operation. Immediately we were faced with our first problems—coding and form design. Here is where our plans for integrated data processing began and, without careful planning and foresight, could well have ended. Integrated data processing shows no respect whatever for departmental lines but, rather, is a method of integrating all or many separate department functions into one master plan. Therefore, before effective codes could be established, all departmental requirements, both present and future, had to be investigated thoroughly, with particular emphasis on the future. The utmost degree of cooperation from all department heads and supervisors was imperative in this most important phase of integration.

Our existing product codes were composed of combinations of alphabetic and/or numeric characters of varying digital quality, such as: 171 (costumer),

TDEOT-120EP (table), 9401-L (file), MTFBR-46 (desk), and 107B PF-101 & EV-301 (chair). In time an individual could conceivably memorize these mysterious combinations but, contrary to some popular beliefs, an accounting machine cannot. In regard to our customers, we had no existing code arrangement at the time which, we might add, made the task considerably easier. We finally decided upon a five-digit numerical product code which would enable us to sort our items readily on automatic equipment into product lines, general class, style, and color. Our customer code took the form of thirteen numerical digits indicating sales territory, state, county, city and name of customer. Each category of the customer code was arranged in alphabetical sequence for proper listing purposes.

The next step was to convert these codes into language that the new equipment could understand—punched tapes or cards. Because of their superior handling qualities, we decided on the use of edge-punched cards. In addition to punching the codes into the cards, we added program punches which would direct the machine operations in regard to registration, skipping, stopping for variables, and selecting by-products information for independent tape punching on auxiliary equipment. While this monumental task was being completed, we were concentrating on designing new forms to be used in conjunction with our proposed overall plan.

Here again, careful study was made of possible adaptations of integrated data processing before forms were ordered. Compatibility of related forms is a critical point to be thought out minutely before moving ahead. In our case, we revised our order and invoice forms so that they were compatible in regard to size, registration and design. There was also, at this time, a possibility that our bills of lading might be prepared on another unit of the equipment located in our traffic department. Therefore, our bills of lading were revised so that they would be adaptable to automatic preparation at any future moment.

The System and the Results

Once the forms had been delivered, we were at last prepared to move ahead with our new procedure. A typical order is now processed in the following manner:

1. The customer and product edge-punched cards are inserted into the reading station of the Flexowriter, activating the machine to type all constant information, such as name, address, customer code, product code and product description. Program codes pre-punched in the cards automatically control registration and stop machine

operation at points where variable information is to be inserted. While the order is being prepared, two by-product tapes are punched simultaneously. The first tape contains the complete order, including certain program codes which will have later application in preparing the invoice. This tape is filed away in the billing section of the department awaiting notice of shipment. The second by-product tape contains only selective information such as order number, customer code, quantity ordered, product code and dollar totals. This tape is sent to a service bureau for conversion into tabulating cards. The cards are then processed to supply us our various order analysis reports.

2. Upon notice of shipment of an order, the billing clerk pulls the order folder containing the complete order tape. This tape is "read" activating the automatic equipment causing reproduction of all constant information on the invoice. Functional codes punched into the tape at the time of order entry stop the machine action at areas where variable data is to be inserted manually by the operator, (e.g. quantity shipped, shipping date and invoice date). Again a by-product tape is created selecting pertinent data. This tape is processed through a tape-to-card converter to transfer the information to punched cards. We are then able to prepare the following reports:

    a. Sales analysis by customer, by city, by state and by territory.
    b. Detail sales listing for inventory purposes.
    c. Analysis of gross profit by item, by line.

Thus it can be seen that, as a result of the initial entry into the tape when the order was prepared, tapes were created for: later billing, order analysis, and sales analysis reports. After acceptance of our sales analysis reports by management, we had completed our initial integrated data processing applications.

Making Progress With Integrated Data Processing

We are presently investigating the possible use of a Friden Computyper for billing. This equipment is capable of making all calculations on the invoice automatically, thus eliminating manual calculations. If this unit is purchased, we plan to install the present Flexowriter in the purchasing or traffic departments where we are currently making studies to determine adaptability of procedures to integrated data processing. Consideration is also being given to equipping our Flexowriter with a direct key punch hook-up thereby eliminating tape-to-card conversions. Our first entry into this field has taught us that integrated data processing is more than the purchase of automatic equipment.

To others who plan to embark on a similar installation, we should like to emphasize three important points:

1. Take the time to "sell" all affected departments on the merits of the program. They will provide invaluable aid.
2. Plan each step thoroughly before taking any action. Examine all facets of the problem before ordering equipment or forms or establishing codes and procedures.
3. Most important of all, give considerable thought to future expansion of the program.

Integrated data processing cannot be purchased. It must be earned through planning, cooperation and imagination.

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MACHINE ACCOUNTING AND THE MEDIUM-SIZE BUSINESS

HARRY M. BELL

A medium-sized company may be in no position to consider the purchase of electronic data processing equipment, but this is no reason to deter it from making the decision to switch from manual to machine accounting. Four of the leading office equipment manufacturers produce excellent accounting machines in the $3,000 and up range. Basically, by placing the records on accounting machines, it is possible to post the subsidiary ledgers and to make the necessary distribution simultaneously with the writing of the journal. This not only reduces the time by making two or more entries at once, but guarantees that all entries are identical. The accuracy or proof of posting is visibly indicated on the journal. It is also possible to post directly to the general ledger, if desired.

Some operations become almost wholly automatic, such as the payroll. With most of the accounting machines of today, you only have to index the pay-rate and hours worked and deductions and the machine does all the rest, even to the extent of discontinuing to withhold Social Security tax when the $4,200 maximum is reached. In fact, in almost all accounting operations on machines of any sort there is considerable automation such as the printing of the date, of balances, and the labor-saving feature of carrying automatically the totals of the various columns. There is also the obvious advantage of the neatness and uniformity of the accounting records.

Adequate time should be spent with the representatives of the accounting machine manufacturers to determine which equipment best fills the particular requirements of the business, with proper emphasis on the factors of service and availability. After the decision has been reached regarding which machine to purchase, the controller should work closely with the representative of the seller, in designing forms to be used in the system and on the accounting machines.

Some machines provide a typewriter keyboard, some do not, and on some it is optional. There is a point here. Before falling into the trap of thinking that every thing can be done on the accounting machine, without consideration of input methods remember that no more work can be processed through the machine than the operator is capable of performing in a given period of time. Your requirements may point up the advisability of buying a machine without a typewriter keyboard and also some form of automatic addressing equipment which will perform your listing requirements. Most information required on journals and ledgers can be obtained by coding numbers rather than use of words. On the other hand, for some businesses, the typewriter keyboard is indispensable.

In ordering the accounting machine and setting the date for the installation of the new system, remember it is essential that operator training be provided for it is a good idea to have practice sessions until all kinks are worked out and each employee is fairly familiar with the requirements of his new job. It may be advisable to make the change-over at the end of the fiscal year as a natural time of transition.

After machine accounting is installed and operating, it will be found that the accounting department has much greater flexibility, there is considerable improvement in accuracy, the necessity for overtime is practically eliminated, and all work is current. The working conditions will be better and, correspondingly, the morale of the employees will be considerably improved. More information will be available to management on the operations of the business and much faster than ever before. In the ordinary instance, financial statements for the previous month's business can easily be available by the tenth of the following month.

Insurance in Long-Term Planning
The Case of the Covered Corporation

by D. W. HERRON

BASICALLY A MEANS OF SHARING existing risks, the insurance contract in its earliest and simplest form was devised with the complete business venture in mind. Casualty hazards have become more controlled but are still present in modern business as static risks, i.e. occurrences which might cause losses to the insured's assets or create liabilities which did not previously exist. Modern business is also concerned with dynamic risks, i.e. the changing aspects of business competition, expansion, employee development and motivation.

Static risks are much more easily identified than dynamic risks because they represent measurable tangible losses. Casualty insurance has been classified by the various sources of these losses and various indemnifying contracts have been created to meet these hazards. The purchasing of such indemnity contracts is, by no means, a simple matter even while concentrating on the more simple perils. Protection of existing assets and conditions has become a technical skill of some importance. It is no wonder it often appears to be the sole goal of the insurance investor. The purchaser has a choice of capital stock or mutually owned insurers. He might even join a smaller group to insure reciprocally or provide reserves to carry his own losses. He might seek complete indemnity or limit his losses to amounts beyond determinable limits known as deductibles. He might reduce premium cost by agreeing to insurance within certain percentages of insurable values under a co-insurance clause carrying an obligation to purchase the required amount or suffer a penalty in the event of loss by the ratio of the insurance carried to the required amount.

Turning to dynamic risks, we face the changing elements in a company's position in a competitive economy and are met with an entirely different concept of the compensation factor in the insurance contract. Gone is the consideration of restoring the status quo and in its place we find an indemnity geared to the changing plans of the insured. Risks are no longer thought of as fire,

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D. W. HERRON is Secretary of New Monarch Machine and Stamping Company, Des Moines, Iowa. Previous to his present position, he served as Controller of Monarch Machine and Stamping. Before joining this company, he had spent fifteen years in public accounting and office management.

theft or liability. Instead, we are thinking in fields such as financial requirements, employee morale and motivation or plant expansion. Cost is no longer a dollar outlay, but a measure of relative effectiveness. Control is no longer a matter of relating a program to present values, but a constant attention to the changing plans of the operating organization.

These changing considerations can be illustrated best by using a hypothetical case. Let us assume that the Covered Corporation is a successful metal products company producing both end products and items subcontracted for other manufacturers. A few of its pertinent statistics are as follows:

Buildings

Description	Age	Book Value	Net Sound Value	Replacement Cost
No. 1 2-story Brick	35 yrs.	$ 40,000	$100,000	$175,000
No. 2 2-story Brick	10 yrs.	400,000	500,000	550,000
No. 3 1-story Stucco	15 yrs.	30,000	50,000	60,000
No. 4 1-story Stucco	15 yrs.	30,000	50,000	60,000
No. 5 2-story Brick with office on second floor	25 yrs.	50,000	150,000	250,000

Financial

Gross income	$7,000,000
Raw materials used	4,200,000
Average inventory—Raw	750,000
Average inventory—Finished goods and in process	700,000
Salaries of officers and administrative employees	150,000
Salaries of technical personnel	800,000
Other salaries and wages	1,200,000
Light, heat and power	100,000
Taxes other than income	60,000
Interest on bank loans	2,000
Net earnings before income taxes	300,000

Personnel

Officers and administrative	25.
Salesmen	10.
Technical employees	100.
Other employees	365.
Total	500.

Buildings

No. 1 to No. 4 are on land owned by the corporation. Building No. 5 is leased property. Only Building No. 2 is sprinklered.

The corporation owns 14 trucks and passenger cars.

The foregoing figures have no relationship to any existing company and are of value herein only to the extent that they define size and operating con-

siderations of the hypothetical case. We can assume that the company has a fairly adequate insurance program designed to control its static risks with primary emphasis on protection of tangibles. As to development of the program beyond that point, let us assume we have given the responsibility of planning the insurance program of the Covered Corporation and that we have been included in all planning discussions of the corporate officers.

Risks Related to Financial Planning

Our first consideration is that of financial planning to see that current operations are not impaired by any lack of funds. We know that the corporation is growing. This means that the most important policies to the company are the business interruption contracts and liability coverages. The business interruption policy should be planned with careful consideration of the cost of restoring operations. The proportionately large number of technical employees should be taken into account in determining the form of the policy. The gross earnings form provides for an indemnity including all payrolls. The two-item form sets out the ordinary payroll as a separate item having a shorter period of indemnity such as 90 days.

Perhaps, with 365 people on the ordinary payroll, the Covered Corporation could use the two-item form. But what about the time necessary to restore operations? Sometimes a gross earnings form at a lower coinsurance rate can be more effective in giving the insured more discretion over continuing employees and thereby meet a protracted period of rebuilding. What about the time necessary for rebuilding? Does the company have in mind plans for reconstruction and estimates from reliable contractors? Certainly these factors enter into the business interruption policy because, in effect, the selection of the coinsurance rate on projected annual gross earnings is an estimate of the number of months required to restore operations. We also know that the Covered Corporation is operating under crowded conditions. The reader can ascertain this from the type of product, size of inventories, number of personnel and number and valuation of buildings. Under such circumstances management might frequently rent additional storage space elsewhere. We must be careful to see that our business interruption insurance is endorsed for all of these locations. We know our products are complicated and take time to fabricate as shown by the nature (metal) and the number of technical employees. How long would it take to replace finished stocks? Raw material in this field requires weeks, even months, to replace. Are we adequately protected against shutdowns for lack of material because of fire or destruction in outside storage?

The indemnity contract or insurance policy, however, is not all of the protection we need. We are fabricating items as subcontractors for other manufacturers. If a casualty destroys our capacity to deliver, will we lose the customer permanently? Or do we have definite information as to the facilities of other manufacturers in the neighborhood who might sub-contract the work for us so we might maintain delivery schedules? What additional expense would be incurred by having this work contracted? Would we incur any penalties by delayed deliveries on any contracted work, especially government contracts? It may be desirable to carry an extra expense policy or endorsement to provide for these possibilities.

We might summarize our protection program for business interruptions:

1. A plan for reconstruction and an estimate of time required.
2. An indemnity contract or insurance policy endorsed for all locations and extra expense requirements.
3. Information as to available subcontractors.
4. Cost records in fireproof files for analysis of subcontracting losses.

Liability contracts cover perils which could be equally destructive of working capital. What limits would be adequate for the Covered Corporation so that a lawsuit would not seriously impair the company's finances? Have we followed the all-too-common idea of insuring company autos and trucks with $50 deductible collision policies and have we considered liability limits of $100,000 adequate? Actually, the additional cost of higher liability limits, even with overriding contracts, is not much. On the other hand, the collision peril is a calculated risk which, even if omitted, might have very little consequence on the financial condition of a corporation of this size. Money spent on liability premiums is far greater financial protection. The same situation applies to the public liability policies relating to personal injury or property damage on the corporation premises.

And what about product liability? The Covered Corporation has many end products of its own. What study have we made of the types of perils involved by ultimate consumers? Perhaps even the end products of our customers might offer possibilities of risks which might involve our part of the product. Do our customers who complete the product have product liability insurance? Do we employ any contract haulers to deliver our products or bring in raw materials. Do they carry liability insurance in the same limits we feel are necessary? Are there any loopholes whereby a sudden unpredictable liability could upset our financial program?

The amount of insurance we will buy and the types of policies we will need will depend on the possible danger to our financial program with more em-

phasis on open-end risks than on the calculated risks. In other words, we may be content to lose a little now and to invest our insurance dollars for protection against the perils that could really hurt us, even destroy us.

Perpetuation of Working Force

The second major consideration is the perpetuation of the working force. Progress is made with money and men. We have seen how business interruption insurance can provide funds to maintain payrolls, but there are other ways to lose needed key personnel. The Covered Corporation has many technically skilled employees and the work involves some hazards. Insurance has a considerable part in improving the security and morale of employees. Protection of this type is chiefly of two kinds, that which protects the worker from hazards of his work and that which protects him and his family from the perils which may happen at any time, including providing for retirement.

It would be easy to assume that the Covered Corporation might have a poor accident record because of crowded conditions. Let us suppose that this condition exists and that we find that we have a "debit" condition, which means that our workmen's compensation losses have been so heavy as to require our paying an additional or higher rate for that particular insurance. We are also assuming that the corporation is located in a state wherein state insurance is not mandatory, but wherein the insurance company is required to use rates set by states or regional rating bureaus.

Part of our insurance program is to form a safety committee to work out safety methods and devices. The indemnity contract, itself, may be purchased conservatively with the idea that accidents are not avoidable and, therefore, the type of policy which limits the negative effect of losses to a minimum may seem desirable. This type of policy carries a rate usually determined by reviewing three or more years of benefit payments. Individual losses are limited to a maximum amount, such as $1,500, so the severe accidents do not affect the rate more than moderately severe accidents. The rate developed may be more or less than the standard or "manual" rate depending on the experience of the insured. This rate, however, will be in effect for a full policy year and will be applied to payroll figures by various classifications to determine the total premium earned under the indemnity contract. The only adjustment of this rate for the year will be the possible dividend credit if the insurer is a mutual company. The insured takes no chance that current experience will immediately increase the current premiums, but he does not stand to benefit immediately from reduced losses.

A company the size of the Covered Corporation would pay sufficient premium for Workmen's Compensation insurance to consider one of the many "retrospective" plans that allow additional credits for reduced losses but exact additional premiums if greater losses are incurred. Certainly, policies of this type expose the insured to the possibility of greater risk but, if the possible savings would provide a management incentive for an efficient safety program, the long-term benefits to the working force might well outweigh the early losses.

Another type of employee security is involved in the various group plans of hospital, surgical, sickness, accident and life insurance made available to employees at a reduced rate, either with or without company participation in paying part or all of the premiums. Without going into the many types of policies available, we are aware that this type of insurance has a great effect on the employee's continued affiliation with the company. For this reason, plant-wide plans are not always the most desirable. Certain groups may be entitled to sick leave benefits while other groups would not be paid for time off for non-occupational sickness or accident. Groups having sick leave benefits would prefer the type of policies which specify a greater waiting period before benefits begin. Such policies could offer greater indemnity benefits for even less premium payments if the indemnity period were delayed.

The provision of profit-sharing or pension plans for future payments and their effect on employee morale is a subject in itself. They cannot be treated here but merit mention for a place in the long-term planning.

Insurance Implications of Planning for Expansion

Now let us look at the company's plan for expansion. The "static" risks of fire, extended coverage, vandalism and sprinkler leakage insurance as protection for existing values have been anticipated. As insurance administrators, we also know that the company is in need of additional space and is contemplating some new construction. These facts we have revealed to the reader by the evidence of crowded conditions, the fact that some buildings are unsprinklered and the circumstances that the interest paid on total indebtedness is low and the company is not at the present heavily involved with outside debt.

Since the company's offices are located in an older building on leased property, it might seem advisable to plan for a new building including office space. We cannot overlook the fact that the lease agreement may require that, in the event of destruction, a similar building would have to be erected on the premises. If, therefore, our long-term plans provide for the use of Building No. 5 even though the offices were moved, we should consider sprinklering the building

both for safety and reduced insurance rates and carrying the repair-and-replacement endorsement on the policy. This endorsement would provide for full compensation for the cost of the required new building, rather than payment for the depreciated value of the old one.

Building No. 1, on the other hand, is quite old and perhaps of obsolete design. We are under no requirement to replace it identically and we might find that a policy for the net sound value of $100,000, or 90 per cent thereof under the coinsurance clause, would provide a structure even more suitable to our needs. The repair-and-replacement endorsement would be omitted and the consideration of the sprinkler system would depend on remodeling of the present structure and the hazards presented by the present condition.

Building No. 2 is sprinklered and has a high net sound value in relation to the replacement value. Since we are not heavily in debt, we could borrow in the event replacement were necessary. Therefore, we will omit the repair-and-replacement endorsement on this building and consider how we might add to the plant to extend the sprinkler system from this building to other buildings. The two minor buildings, of course, receive less consideration insurance-wise, except to include their capacities in our expansion plans so as to approach a single indemnity coverage for all buildings.

We are not interested specifically in replacing what we have in the event of a fire or similar casualty. We are more interested in what we are planning to do and to gear our insurance indemnities to provide adequate replacements in keeping with that plan.

Where To Start

The considerations of long-term planning touched all too briefly in the foregoing may whet the administrator's appetite for a more thorough study along these lines. However, he may have difficulty in determining a starting place for developing his planning material. The key to effective planning is the continual referral to the plan. Since the application of insurance as a long-term planning tool is a correlation of financial and insurance thinking, it would be advisable, as the first step, to set up an insurance control that would have some accounting relationship. This possibility is especially true in the smaller company but would be equally effective with the Covered Corporation whose treasurer or controller might be the insurance buyer.

A suitable control record is essential. A simple control can combine a card summary of the insurance policies in force with the computation of unexpired premiums and periodic expense. One card is prepared for each policy from the

invoice of the agent or broker. The basic information is similarly located on each card so the necessary details are easily read. The information is filled in on the card from the insurance policy and total premium entered as a charge in the debit column. The total premium is also entered by policy number on a summary card of the same type, omitting detailed policy information. Each month the computed expense is relieved from each card by credit and the total of these credits is posted to the control card representing the monthly charge to expense.

The cards may be kept in a desk, visible file or a floor file, indexed with visible signals to indicate due date by month and year. The cards may be grouped in the file by perils or locations to provide quick analysis of total amounts provided. The control feature of the file lies in the fact that it is the basis of the regular monthly accounting computation of the expense provision and must be examined at least once a month for this procedure. Since endorsements are posted to the same cards, the monthly expense provisions are an up-to-date analysis of insurance costs.

The next step is to prepare a file of planning data and supporting information outlined in the foregoing considerations. After these first two steps have been taken, it will be possible to extend the analysis by conducting conference discussion. Wherever a decision with regard to an insurance contract is concerned, the professional consultant should be called into the conference. The independent broker and the insuror's representatives are specially trained in these considerations and have the benefit of wide experience.

The Dynamic Risks Now Most Important

Insurance, an important factor in the day-to-day protection of the modern business, has been projected in this article into a tool for long-term planning. We have discarded the viewpoint of purchasing policies to offset risks and have aimed our insurance provision to accomplish long-term objectives. Because good finances are required to establish and maintain working facilities and equipment and to compensate the employees to produce their full potential of accomplishment, we have discussed first the financial problem, as we touched on the following important fields of consideration: financial planning, perpetuation of working force and plant expansion. We have developed some examples of meeting the dynamic risks in these areas. The information presented has been elementary, but it can be the basis for developing an effective skill with the insurance tool toward the assurance of a successful business venture in its modern concept, the same as sought by early merchants when insurance was created.

Useful Production Information From Punched Tape Equipment

by JACK M. CARMEAN

THE IDEA WHICH culminated in our adoption of the approach described in this paper to a stock control and payroll data problem was the integrated data processing principle of recording data at its source in a common language which can be processed further by compatible machine mediums. The Inca Manufacturing Division, which is the magnet wire fabricating division of Phelps Dodge Copper Products Corporation, produces magnet wires in a myriad of insulations, shapes, and sizes—any of which may be wound on many different types and sizes of spools and paks. Essentially the same data is required for controlling of sales stocks as is used in the preparation of underlying production data for payroll for the departments processing the finished wire. We saw that, by recording the pertinent data in punched paper tape at its source, we would, in effect, be eliminating dual posting and subsequent accumulation of source data necessary under the previous manual system.

The Inspection Procedure as Related to Production

The manual approach previously utilized, depicted in Exhibit 1, began at the point of delivery, from the production areas of the various pin trays of wire on skids to the inspection areas. The wire from the various trays is pulled off in individual spools by the inspector's helper who unwinds a section of the wire and passes the spool to him. In the past, the inspector would check the spool for defects, such as incorrect sizes of both insulation and bare wire, bad spooling, etc. If the spool passed inspection, it was placed on a scale by the inspector who read the weight from the scale and recorded it on a Box Slip (Exhibit 2) on which he had previously indicated the product and specification number, the wire size, type of wire, etc. The inspector followed the same routine

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JACK M. CARMEAN is Systems and Procedures Coordinator, Phelps Dodge Copper Products Corporation, Fort Wayne, Indiana. He is responsible for the coordination of all office methods and procedures for Inca Manufacturing Division, and Indiana Rod and Wire Division of Phelps Dodge Copper Products Corporation, and is also Manager of Machine Accounting Department. Mr. Carmean is Treasurer of Fort Wayne Chapter.

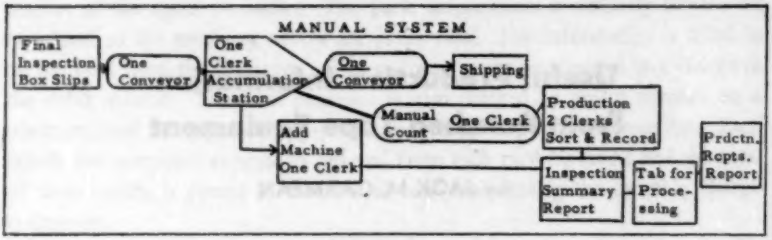

EXHIBIT 1

for each spool. As the box became full he placed the slip, bearing the weight of each spool plus the indicative information, in the box and put the box on a conveyor.

The boxes were moved on the conveyor to the accumulating station where the slip was taken out and the previously-entered weights totaled on an add-

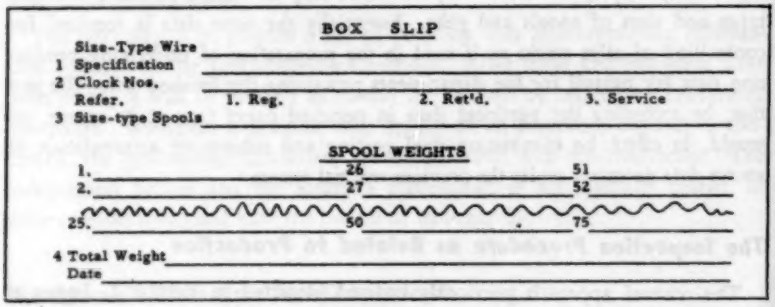

EXHIBIT 2

ing machine. The box slip was then inserted in the adding machine where the weights and the item-count total for the box were printed on both the slip and the adding machine tape. The adding machine operator then placed the

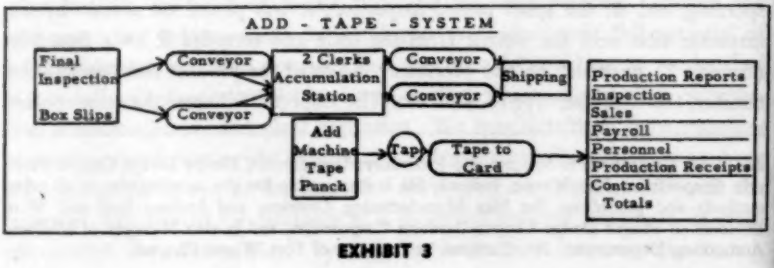

EXHIBIT 3

box slip and the tape section into the box, which was moved to a checker at another station. He was responsible for recording the weight from the box slips on a tally sheet by types of wire, weight, and spools and for entering the data on a card which was attached to the box front. A box slip was retained at this checking station and periodically collected by office personnel for sorting and later preparation of the daily inspection summary report.

But Little Useful Information

This report, which was prepared by office personnel of the inspection department, was completed on the following day and indicated the previous day's transaction, insofar as total weight and number of spools for each wire size and product was concerned. It was distributed to the various factory foremen, superintendents, and other interested personnel for their information as to items inspected, items rejected, and sales stocks on hand. A copy was received the following day in the tabulating department where cards were generated for each report line and were used to reduce the quantities on order and to increase the quantities available on the daily stock report. However, it was entirely innocent of production-related payroll information. It thus became quite obvious that the manual methods could not be depended upon to provide current up-to-date and accurate production information which could be readily used by the production, sales, and payroll departments in their daily operations.

Our present procedure depicted in Exhibit 3 is essentially the same as under the manual operation until the boxes from the station have arrived at the accumulating station, at which point we interjected an adding machine which has the additional ability of creating an eight-channel punched paper tape. The punched tape generated in this operation is forwarded to the tabulating department for same-day conversion into tabulating cards utilizing a tape-to-card-printing punch. The cards, thus created, do not require either key-punching or verifying operations. They can be utilized to record receipts in the daily stock report and a sales analysis report and to cause preparation of a modified inspection report for the production department on a daily basis as well as supplying the clock numbers of inspection department personnel and number of spools inspected, for reconciliation of pertinent payroll data.

Introduction of Adding Machine With Tape Punch

The equipment selected is an adding machine incorporating a tape-punching mechanism. As items are printed, printed and added, printed or subtracted

on the adding-machine tape, essential data pertinent to the operation being performed is automatically punched in an eight-channel paper tape. The printed tape, of course, is the original document and may be used in the normal manner. However, the punched paper tape is processed through tabulating machines to produce cards for preparation of various report information.

On the adding machines we have selected, the window above the keyboard shows each item entered before it is punched, added, or printed. An error detected at this point is corrected merely by depressing the clear-keyboard key and re-entering the item correctly. If an error is detected after the printing cycle, a touch of the error-void key will void the incorrect data punched into the tape. The adding machine tape punch perforates tape at a speed of over 1,000 characters per minute. The keyboard is free for subsequent entry while the tape is being punched. A built-in interlock prevents errors in perforation of the eight-channel paper tape, as well as punching self-checking codes of the odd-even bit type.

Depression of the total key causes both a numerical total and a control impulse which, in our circumstance, is "end-of-card," used in controlling the tape-to-card punch. The print-only key will cause the tape to be perforated and the entered data to print only when either five or eight digits of information are entered from the keyboard. This feature was engineered especially for us in this operation. All other operating keys—the add, subtract, clear-keyboard, and sub-total—cause printing or clearing but do not actuate the tape-punching mechanism. We felt, from an overall speed and ease-of-operation standpoint, that a ten-key adding machine had substantial advantages over the conventional ninety-nine key keyboard adding machines.

What It Meant to Production Data Processing

In any procedure which we could have utilized at the accumulating station, the addition of the individual spool weights as recorded on the box slips is essential in arriving at a total weight for the box of spools. As mentioned before, handwritten entries are made on the box slip as it progresses from the inspector to the accumulating station. Indicated on the box slip by the inspector at the time the wire is being inspected are all of the data pertinent to the individual transactions, such as wire size, product and specification number, inspector's clock number, helper's clock number, type of wire, and the number of spools. All of the aforementioned data comprise twenty-one significant digits, which can very easily be expressed in a numerical code. Thus, by recording the data at its source in punched paper tape, we have eliminated the many

subsequent manual handlings of the various segments of information shown on the box slips. When the box slip gets to the add-punch operator, it is entirely completed except for total weight. The work flow from this point on is as follows:

Steps	Box slip Identification	No. of digits Entered	Depress Control key	Punch in tape
(1a)	Size-type wire	3	Print only	Yes
(1b)	Specifications	5		
(2)	Clock number	8	Print only	Yes
(3a)	Specification reference	1		
(3b)	Size-type spools	2		
(3c)	Spool count	2	Print only	Yes
(4)	Individual spool weights entered and added	2 to 6	Plus	No
Box slip inserted, between paper roll and ribbon, to print on total weight line		2 to 6	Sub Total	No
Box slip taken out and paper toll totaled		2 to 6	Total	Yes
(Code is punched tape)				Yes

The original and duplicate paper rolls are torn off immediately. The original is placed in the box for the customer's reconciliation. The duplicate paper tape is retained for possible reconciliation purposes in the tabulating department. The punched tape is rewound on a spool as it is run. As each day's activity is completed, the punched paper tape is removed from the take-up reel, placed in a glassene paper box, and sent by the next direct mail to the tabulating department for conversion into tabulating cards and subsequent report preparation.

More Information Rises to the Top

At its best, the inspection summary report, which was the only report prepared from the manual method, did little more than bring the stock report up to date after key-punching and verifying an entire day later. In adopting the adding machine tape punch method, we were able to eliminate the time of two clerks previously engaged in sorting box slips and typing summary reports. By reason of having payroll information available in the tape at its source, the creation by hand of two additional postings was eliminated, with the end result being currently available up-to-date analyses of payroll, records of production, etc. We feel that, by making this data self-perpetuating at its source, we have made a definite advance along the road to a complete integrated data processing system.

MACHINE ACCOUNTING IS A PROCESS AND NEEDS PROCEDURES

JOHN L. BROCKETT

We have all frequently reviewed the operating procedures relating to purchasing, accounts payable or timekeeping, but how many of us have ever established procedures for the operation of the machine accounting installation? The procedures which are needed for a machine accounting group are not designed to verify quantities or prices or determine whether a document has the proper approvals. Rather, they relate to devising reports, utilization of the detailed information, design of the document transferring the data and the scheduling of the department in relationship to the available time.

These procedures must reflect co-operation of other data processing departments. For example, it is desirable to design cards in such a manner as to enable the keypunch operator to obtain the necessary information from the source document in the least amount of time. It is also essential for other departments to segregate the source documents into control groups or batches for ease of processing and to insure proper internal control or for these departments to establish a dollar control on each batch of source documents. The tabulating department should have knowledge of the control amount.

The development of the procedures should encompass the four basic accounting functions: recording, processing, classification and summarization. The recording function would include controls over source documents. The controls would include the recording of control totals, editing the documents for completeness and arrangement of data, auditing for correctness if necessary and the transcribing of the source documents into the punch card. This function would also logically include the design of the individual cards in such a manner that the basic information would fall into the same field, on the several cards, to facilitate gang punching and reproduction. Any auxiliary processing which must be accomplished—calculating, reproducing, comparing or collating must be likewise considered. The classification and summarization function will inlude such features as report design, due date scheduling and the actual report preparation.

In order to properly chart this whole process, i.e., the transformation of information from the source document to the final report, it is essential that a flow chart be constructed, which will be the pictorial resume of the procedure. All of the related processing should be described in detail.

The procedures should also include a determination of utilization of machine time and personnel. Without this information, it is impossible to properly schedule the workloads for the department, both for machines and people, regardless of how detailed the procedures may otherwise be. The work load must be carefully correlated with the receipt of documents for processing and the time schedules which are in effect for the release of the final reports.

Raw Material Cost Control In a Gray Iron Foundry

by THOMAS B. NOBLE

CLOSE COOPERATION between the metallurgist, raw material buyer, operator or melting department supervisor, and cost accountant is necessary for most effective control of gray iron foundry raw material cost. The accountant must look to the metallurgist for material specifications upon which to base raw material budgets or standards. The metallurgist must see that castings with certain physical and mechanical properties are produced. A practical, cost-conscious metallurgist will strive to arrive at the lowest-cost combination of materials having the properties necessary to produce castings of the required analysis. The metallurgist needs information constantly from the buyer about price and supply changes and the accountant can give considerable help at this point by pricing and figuring the various mixes or combinations of materials being considered. The operator or melting department supervisor also plays a vital part on the control team. He needs prompt and accurate reporting of cost data and comparison of actual performance with standards. The good operator must have the constant help of the metallurgist. He will welcome the help of the cost accountant who understands his problems and supplies him with cost data.

Raw materials in a foundry are all materials charged into the cupola, including coke and flux material, and all alloy materials and innoculants used as ladle additions. Some foundries do not classify the non-metallic portion of the charge, principally fuels and fluxes, as raw materials, but treat such materials as supplies. However, it is not only convenient but logical to treat all of the materials described as raw materials. Cupola operation involves much more than the simple application of heat to melt metal. A complex thermochemical reaction takes place in which heat is developed from sources in addition to coke and which requires heat for purposes other than melting iron. The process results in yield, which means good castings made from the metal melted. This is

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THOMAS B. NOBLE is Treasurer of Stockham Valves and Fittings, Inc., Birmingham, Alabama. He has been affiliated with this company since 1943, after several years of public accounting and controllership experience. Mr. Noble is a previous contributor to the *Bulletin*, and a past president of Birmingham Chapter.

STANDARD RAW MATERIALS FOR GRAY IRON FOUNDRY - FOR BUDGET ALLOWANCE

EFFECTIVE: April 29, 1957 SUPERSEDES: October 1, 1956

Cupolas lined to 5¼ inches I.D.
Standard yield - % of total metal charged - - - - - - - - - - - - - - - - - - 68.0%
Standard metal loss - % of "new metal" charged - - - - - - - - - - - - - - - 3.5%

MATERIAL*	ANALYSIS % C	% Si	% S	% Mn	% P	LBS. PER CHARGE
Total Lbs. metal content of charge	69.96	49.41	1.51	13.24	10.13	2 019
Foundry Coke						200
Limestone						50

ANALYSIS SUMMARY	GROSS ANALYSIS OF CHARGE	MELTING GAIN OR LOSS	CASTINGS EXPECTED
Carbon %	3.45	+ .10	3.55
Silicon %	2.45	− .20	2.25
Manganese %	.65	− .20	.45
Phosphorus %	.50	.0	.50

CUPOLA BED REQUIREMENTS:
Coke 2800 lbs.
Limestone 420 lbs.

* Returns, pig iron, steel scrap, cast scrap, briquettes

EXHIBIT 1

expressed as per cent of total metal charged. Metal loss occurs in processing and designates metal which disappears or is lost between the time it is charged into the cupola and the time it is checked out as good castings. It includes losses due to the factors covered by the common term, "melting losses," such as oxidation and removal of impurities in melting, plus all other losses in the foundry. It, therefore, includes losses in handling after the metal leaves the cupola spout. Metal loss is best expressed as a percentage of "new metal" (pig iron, scrap and ferro alloys, or all metal charged except re-melt or returns). Metal loss is figured by the formula: $\frac{M - P \times 100}{M} = L$ when M is the weight of new metal charged, P is the weight of good castings made, and L is the per cent of new metal lost.

Returns and re-melt are terms which may be used interchangeably to designate gates, sprues, spilled iron, excess iron pigged and foundry fault scrap recovered for re-melting. Cupola bed or just "bed" identifies the coke and stone laid in the bottom of the cupola at the start of each operating period or heat. The bed must be laid and burned-in before charging is started. The preparation, height, and burning-in of the bed are among the most critical of the operations necessary in cupola melting.

Quantity Standards Underlie Material Allowances

When the accountant prepares to set a raw material budget for the gray iron foundry, he must first get raw material quantity standards from the metallurgist. For this purpose the accountant needs only the material specifications and quantities shown in Exhibit 1, the metallurgists work-sheet for computing the cupola charge, plus the standards for yield and metal loss. However, study of the form will help him understand the problems of the metallurgist. The expected analysis of castings, shown in the "analysis summary" section at the bottom of the form, is the metallurgist's starting point. He knows the melting gain or loss to be expected for each of the elements and can calculate the gross analysis of the charge necessary for the expected casting analysis. Working from this and with the total weight of the metal content he figures a combination of available materials. Comparative costs of the various materials must be used to arrive at a satisfactory mix of optimum cost.

The preparation of Exhibit 1 may appear to be a relatively simple job, but the accountant should recognize that the metallurgist considers factors not apparent on the form. Operating behavior of the melting unit, probable effect of material size, properties of the coke, melting rate, and fluidity of molten metal necessary to meet the molding requirements are some of the additional factors considered by the metallurgist. Using these figures supplied by the metallurgist, the accountant develops the raw material budget allowance as shown in Exhibit 2, which assumes that two identical cupolas with acid-type linings are used, operating one at a time on alternate working days, and that bottom is dropped at the end of the melting period each operating day. Materials (coke and stone) for the bed must, therefore, be allowed for each operating day.

Basis of the Cost Allowance for Returns (Re-Melt)

The standard charge provides for re-melting returns as soon as they become available. This weight in the charge is not subject to independent selection or control but must be figured, using the standard yield and the metal loss, by subtracting from the total weight of metal in the charge a figure obtained by multiplying the total weight of metal in the charge by the yield per cent and dividing by the complement of the metal loss per cent. This recognizes that the weight of good castings produced should equal the weight of new metal introduced into the process less metal lost. The weight of returns shown in Exhibit 1 was found as follows:

$$2019 - \frac{2019 \times .68}{1. - .035} = 596 \text{ lbs. returns per standard charge}$$

GRAY IRON FOUNDRY RAW MATERIAL BUDGET

EFFECTIVE: April 29, 1957 SUPERSEDES: October 1, 1956

Description of Material ALLOWANCE PER DAY OPERATED	Standard Pounds Per Day	Standard Price Per 100 Pounds	Amount Allowed Per Day
Foundry coke (cupola bed coke)	2800	$1.5205	$42.57
Limestone (on cupola bed)	420	.1005	.42
FIXED ALLOWANCE PER DAY OPERATED			$42.99

ALLOWANCE PER CWT. GOOD CASTINGS *	Pounds Per Standard Charge	Standard Price Per 100 Pounds	Standard Cost Per Charge	Budget Per Cwt. Good Castings
	2019		55.49	4.042
Less: Foundry returns	596	2.7419	16.34	1.190
Net metal and Fe. alloys	1423		39.15	2.852
Foundry coke	200	1.5205	3.04	.221
Limestone	50	.1005	.05	.004
TOTALS			$42.24	$3.077

Total metal and Fe. alloys per charge 2019 Lbs.
Good castings per charge at standard yield (68%) 1373 Lbs.

* Returns, pig iron, steel scrap, cast scrap, briquettes

EXHIBIT 2

Unless the good casting yield ratio is very high, foundry returns for re-melting will represent a significant part of each raw material charge. Returns in the charge given in Exhibit 2 weigh 596 lbs., which is 29.5 per cent of total metal content of the charge. A price must be set for this material if a gross cost of the metal or "metal at the spout" is to be found. Some simply use the price applied to the purchased cast iron scrap in the charge. However, returns ordinarily have a higher value for re-melting than the cost of cast iron scrap bought on the open market. The material is clean and free of rust and scale. It is of known analysis, i.e., that expected for the good castings produced. A very satisfactory method of pricing returns, shown in Exhibit 3 for returns used in Exhibit 2, develops the standard price from the standard cost of "new metal" in the charge, adjusted by the cost of additional materials necessary to re-melt one time and produce castings of the same analysis. Here, again, the accountant must ask the metallurgist for help. He will supply a list of alloys, etc., necessary to maintain the analysis of 100 pounds of returns through one re-melting. Captive foundries usually receive some scrap castings for re-melting, which were made by them and scrapped because of errors in subsequent processes. The standard price for foundry returns should be used for such scrap when it is clean and of the same analysis as current foundry returns being re-melted.

Under some operating conditions, the metallurgist may be of the opinion that the standard price of returns determined as in Exhibit 3 is too high. While he can make additions which will result in a satisfactory analysis, the metal tends to lose fluidity with each re-melting and to have more shrinkage in casting and become harder in relation to strength. He may, therefore, suggest a further reduction of some flat percentage of the standard price.

Weekly Allowances and Weekly Variance Analysis

A comparison of the standard cost of raw materials used with the budget allowance should be made at least weekly. Using the daily and per hundredweight allowance amounts given in Exhibit 2, the budget allowance for a week would be figured as follows:

304, 300 lbs. good castings @ $3.077 cwt. =	$9,363
5 days operated @ $42.99 per day =	215
Budget for the week	$9,578

Perhaps it should be pointed out at this juncture that the methods outlined in this paper can easily be used in foundries not operating under a standard cost system bringing standard prices into the accounts. A simple work sheet for figuring the standard cost of materials consumed can be used to develop the actual amount for comparison with the budget.

A form of weekly variance analysis report to be prepared in the cost accounting department and given to the melting supervisor and metallurgist is shown as Exhibit 4. The weight of material charged for the week is entered in Column 1. These weight figures are then multiplied by the standard prices to find the standard cost of material actually used, for entry in Column 3. The budget amounts entered in Column 4 for all allowed materials except coke and limestone are found by multiplying the weight of good castings made by the budget per hundredweight as shown in Exhibit 2. The amounts for coke and limestone found in this way must have added to them the daily allowances for the bed, figured from the days operated and the allowances given in the top section of Exhibit 2. The variance amount for each item in Column 5 is the difference between the amounts in Columns 3 and 4. Unfavorable variances should be shown in red. The weight of material represented by each amount of variance is found by dividing the amount in Column 5 by the price in Column 2.

This report not only serves as a valuable tool for the melting supervisor and metallurgist in controlling the consumption of raw materials; it also quickly draws attention to errors in reporting quantities charged. Many foundries find

COMPUTATION OF STANDARD PRICE FOR RETURNS

"NEW METAL" IN STANDARD CHARGE

MATERIAL*	Pounds Per Standard Charge	Standard Price Per 100 Pounds	Standard Cost Per Charge
	1,423		$39.15
Less: 3.5% metal loss	50		
NET METAL RECOVERABLE	1,373		
Cost per Cwt. of Metal Recoverable $\frac{\$39.15}{1373}$ X 100 =			$2.8514
LESS: ADJUSTMENT			
Additional materials necessary to maintain the analysis of 100 pounds of these returns through one re-melting:			
	Pounds Per Cwt. Returns	Standard Price Per Lb.	Extension
Ferro-manganese briquettes	.30	$ .16000	.04800
Ferro-silicon briquettes	.50	.07850	.03925
Sultron	.40	.03660	.01464
Coke	.50	.01521	.00761
			.1095
STANDARD PRICE FOR RETURNS			2.7419

* Returns, pig iron, steel scrap, cast scrap, briquettes

EXHIBIT 3

it extremely difficult or impossible to keep accurate records of bulk raw materials in inventory, and substantial errors frequently accumulate.

The Influence of Yield on Raw Material Cost

The weight of metal which must be melted to produce a given weight of good castings changes in inverse proportion to changes in the yield ratio. Thus, to get 100 lbs. of good castings at 40 per cent yield requires the melting of twice as much metal as would be needed at 80 per cent yield. The yield from an individual pattern may be materially more or less than the average for a heat or for accounting period. The problem is how to recognize such cost differences when costing or pricing individual castings or patterns. The cost effect of a change in yield can be illustrated by adjusting the specifications for the standard charge only to the extent necessary to meet the conditions of an assumed different yield. For this purpose if the standard charge and raw material budget shown by Exhibits 1 and 2 is adjusted to give effect to a yield of 40 per cent the results are:

Good castings per charge	803 lbs.
Metal loss (% of "new" metal) about	5.8%
Returns for re-melting, per charge	1,156 lbs.
Cost per cwt. good castings, exclusive of daily bed materials	$3.221
Excess over the corresponding figure for 68% yield	4.7%

Assuming the same melting rate for the two yield levels, or 45 charges per day for both, the bed materials cost is figured as follows:

At 68% yield:

45 charges times 1,373 lbs. good castings per charge = good castings per day, or 61,785 lbs.

$$\frac{\text{Daily bed cost}}{\text{Daily good castings}} = \frac{\$42.99}{617.85 \text{ cwt.}} = \text{bed cost per cwt.} = \$.070$$

At 40% yield:

45 charges times 803 lbs. good castings per charge = good castings per day, or 36,135 lbs.

$$\frac{\text{Daily bed cost}}{\text{Daily good castings}} = \frac{\$42.99}{361.35 \text{ cwt.}} = \text{bed cost per cwt.} = \$.119$$

Therefore, at the melting rate of 45 charges per day, the total raw materials cost at 68% yield would compare with that at 40% yield, as follows:

Cost per cwt. at 68% yield = $3.077 + $.070 = $3.147
Cost per cwt. at 40% yield = $3.221 + $.119 = $3.340
Cost at 40% yield is 6.1% higher than at 68%

The method of recognizing raw material cost differences due to differences in yield should be established for each foundry from its own operating experience. However, the following method is recommended as the one which will give the most accurate results. After establishing the standard charge and overall raw material budget, as in Exhibits 1 and 2, let the accountant and metallurgist work together to arrive at figures for the raw material standard cost or budget per hundredweight of good castings at enough other yield points to make possible the plotting of a continuous curve by interpolation on a graph. The curve should express the ratio of the raw material cost at all probable yield levels to the cost at the yield used for the budget. An adjustment factor for use in adjusting the budget per hundredweight of good castings to give a material cost for a pattern of any yield can be read from such a chart. For example, using figures from earlier illustrations:

GRAY IRON FOUNDRY - RAW MATERIAL VARIANCE ANALYSIS

Week ended May 5, 1957

Material	(1) Material Charged- Lbs.	(2) Standard Price Per Cwt.	(3) Actual Use at Std. Prices	(4) Budget Amount	(5) Variance Amount	(6) Variance Lbs.
Pig Iron - High Phos.:						
Under 1.75 Si.		$ 2.6232	$	$	$	
1.76 - 2.25 Si.	134,000	2.6455	3,544.97	3,517.71	(27.26)	(1,030)
2.26 - 2.50 Si.		2.6679				
2.51 - 2.75 Si.		2.6902				
Pig Iron - Int. Phos:						
Dealer's steel scrap	22,000	3.2366	712.05	718.15	6.10	188
Cast grey iron scrap (bought)	66,900	2.4107	1,612.76	1,603.66	(9.10)	(377)
Ferro-manganese briquettes	655	16.0000	104.80	106.51	1.71	11
Ferro-silicon briquettes	4,437	7.8500	348.30	346.90	(1.40)	(18)
75% Fe. silicon - Crushed		15.4900				
TOTAL NEW METAL & FE. ALLOYS	315,992		8,690.26	8,678.64	(11.62)	
Bultron		3.6600				
Foundry coke	58,412	1.5205	888.15	885.35	(2.80)	(184)
Purite	1,500	4.5100	67.65		(67.65)	(1,500)
Limestone	13,203	.1005	13.27	14.27	1.00	995
TOTALS			$9,659.33	$9,578.26	(81.07)	

EHIBIT 4

The budget (or standard cost) per cwt. of good castings at 68% yield is $3.147

The adjustment factor to give effect to 40% yield is..... $1.061

Then, to find the standard raw material cost for 100 pounds of good castings from a pattern giving a 40% yield:

$3.147 x $1.061 = $3.34

It will be seen that when using the method explained in the preceding paragraph it is not necessary to give credit for returns in the material cost computation for an individual pattern or casting. The budget or standard cost is set for net good castings. The adjustment factor gives effect to the difference in returns when the yield from the pattern for which cost is being figured is different from the standard yield.

Another method of giving effect to the influence of yield on cost simply charges the cost sheet with the gross cost of molten metal required to pour the mold, and credits it with the returns. This method is used in Exhibit 5. The results obtained depend heavily upon the pricing of the returns or remelt. Therefore, the metallurgist should study the price applied to returns carefully before the method is adopted. This is particularly important when the patterns running produce at a wide range of indivdual yield ratios.

Finding the Cost for Individual Castings

A method of figuring the standard cost for a specific casting is illustrated in Exhibit 5. The basic raw material price data are from Exhibits 2 and 3. A melting rate of 45 standard charges per day was used in arriving at the per-hundredweight bed cost. The melting department operating cost or expense budget was assumed to show average melting cost allowed of $3.75 per hundredweight of total metal melted at the same rate. The cost computations in Exhibit 5 are based on one mold. The information on Lines 1 through 7 is essential to accurate results and should, therefore, be fully understood:

Line 1: The number of castings per mold is known and should show on the pattern record. (The pattern in this example will make four identical castings. If this were a combination pattern to make more than one kind or size of casting, the weight of each would, of course, be needed).

Line 2: The gross weight of one good mold must be found by weighing the castings, gates and sprues from a perfect mold after cleaning.

Line 3: This is the actual weight of the good castings only, removing gates and sprues.

Line 4: The foundry scrap allowance is that which should be experienced for a sustained run under good practices. The allowance of 6% here provides for 240 lbs. or 24 castings of foundry fault scrap for each 100 molds cast.

Line 5: The gross weight of metal which must be melted to pour one mold is the total weight of castings, gates and sprues from one good mold, plus the metal lost in the process. It is found by dividing the total weight on Line 2 by the complement of the ratio of metal lost to gross metal melted. The metal loss one per cent used in setting the standard charge (Exhibit 1) and the raw material budget (Exhibit 2) was converted to a ratio to total metal melted in this way:

$$\frac{.68}{1. - .035} - .68 = .024663$$

Line 6: The calculation to recognize foundry scrap allowed is made here.

Line 7: The average weight of returns per mold is found by subtracting the average weight of good castings per mold from the gross weight of castings, gates and sprues in one mold (Line 2).

A standard cost card for use under the method by which cost variations due to yield variations are recognized by use of an adjustment factor chart, would be somewhat different from that given in Exhibit 5. Lines 1, 2, 3, 4, 5, 6 and 8 would be needed. The cost calculation would not include the credit for re-

STANDARD RAW MATERIAL AND MELTING COST CARD

PATTERN NO. 245127A
CASTING : Plug 127 A
DATE: _____

Line No.			
1.	No. castings per mold		4
2.	Gross weight of 1 good mold		60 lbs.
3.	Good casting wt. ea. 10 lbs. per good mold		40 lbs.
4.	Foundry scrap allowed for this pattern		6 %
5.	Gross metal melt required per mold: 60 ÷ 1. - .024663		= 61.52 lbs.
6.	Average good casting wt. per mold: 40 (1. - .06)		= 37.6 lbs.
7.	Returns per mold: (60 - 37.6) =		22.4 lbs.
8.	Indicated yield : 37.6 ÷ 61.52 =		61.1 %
	COST CALCULATION - METAL & MELTING		
9.	Metal: 61.52 lbs. gross melt @ $2.948 cwt. =	$1.814	
10.	Melting: 61.52 lbs. gross melt @ $3.75 cwt. =	2.307	
11.	GROSS COST - METAL AND MELTING	4.121	
12.	Less Cr. for returns: 22.4 lbs. @ $2.7419 Cwt.	.614	
13.	NET COST PER MOLD - METAL & MELTING	$3.507	
14.	NET COST PER LB. GOOD CASTINGS $3.507÷37.6		$ .0933
	STANDARD MATERIAL AND MELTING COST PER GOOD CASTING		
15.	10 lbs. @ $.0933 =		$ .933

EXHIBIT 5

turns. It can be briefly illustrated as follows, (average good castings per mold 40 lbs.; yield, 40%).

Gross metal melt required per mold	100 lbs.
Metal:	
40 lbs. good castings @ $3.147 cwt. x adj. factor 1.061 =	$1.336
Melting:	
100 lbs. gross melt @ $3.75 cwt.	3.750
Total cost per mold-metal and melting ..... =	$5.086
Net cost per lb. good castings:	
$5.086 ÷ 40 ..... =	$ .1272

System Tested in Use

The foundry raw material budgeting and control methods explained here have been proven over a period of several years of application. They have been effective in holding raw material costs very close to allowances. These methods have also been coupled with incentive pay plans for responsible supervisors, with excellent results. The explanations and illustrations of the interrelationships of total metal melted, good casting yield, metal loss, and returns for re-melting should prove helpful to the understanding of costing problems of all types of foundries.

Departmental Results—
We Get Them From Our Computer

by DONALD J. COPPOTELLI

IN APRIL OF 1957 a computer operator pressed the start button of the IBM 702 large-scale electronic computer located in General Electric's Computer Center in Schenectady and the machine began processing the complete financial data for one of the company's departments located in the Schenectady plant. This was the culmination of nine months of intensive research, planning and programming by a small task force of procedures specialists and computer programmers. This highly integrated system is the first of its kind in General Electric Company although, for some time prior to its inception, the computer had been used to produce payrolls and other financial data. Although a small department was used as a prototype for this very practical application of integration through electronic data processing, it included most of the elements and financial problems of the usual operating department. Complete processing of data under the financial data processing system is accomplished by a single run on the computer each week and a separate monthly closing run.

As an example of the scope of the data being processed through the integrated system, the department using the system includes sixteen major components and more than one hundred reporting units (line foreman and first line supervisors) each requiring specific reporting to maintain control at the workers level. Accounting records are maintained for more than eight thousand individual shop orders and accounts. An average week requires the processing of more than four thousand labor vouchers and seven thousand other financial transactions. Shop workers are on hourly day-work. Professional and office employees are paid on the basis of weekly or monthly salary. All time is distributed weekly. Costs are maintained on a job order cost system. Prior to setting up the integrated system, punched card equipment was used to perform most of the accounting work of the department.

DONALD J. COPPOTELLI is Senior Procedures Analyst in the Accounting Operations Department of General Electric Company. Following graduation in 1949 he entered public accounting in Rochester, New York. In 1952 he joined General Electric Company, and later was appointed to a special study team studying electronic data processing for the Schenectady G. E.'s payrolls.

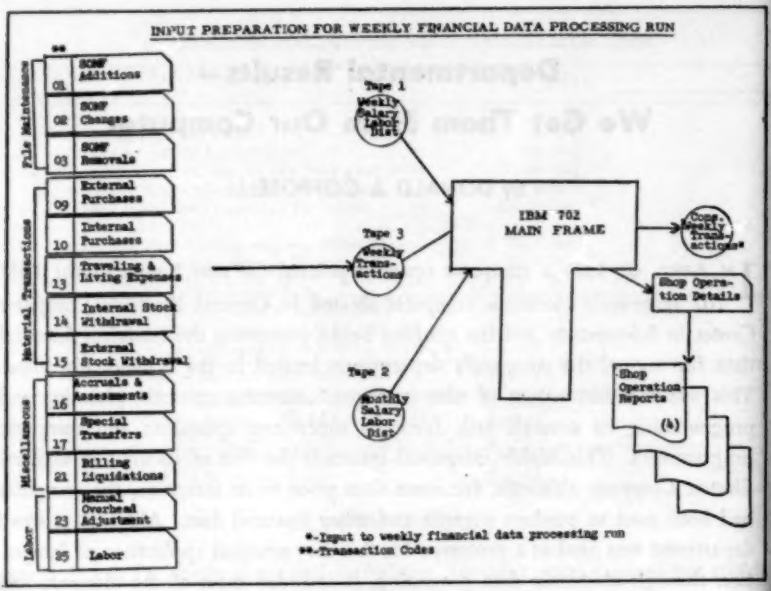

EXHIBIT 1

The study team developed ten basic concepts around which the system was developed:

1. Shop order master file on magnetic tape
2. Automatic payments to vendors
3. Weekly shop order status reporting
4. Weekly voucher comparison reports
5. Mechanized sub-ledgers
6. Automatic monthly billing
7. Mechanized overhead reports
8. Early monthly closing
9. Integrated multi-purpose registers
10. Complete accountability at the foreman and line-supervisor level

One other feature was considered by the study team but was not incorporated in the system. This was the maintenance of inventory and inventory control records by the computer. However, this particular department's inventory was relatively small and therefore was not incorporated as a part of the system. It could easily have been included and, in other departments establishing similar type data processing system, probably will be.

The Information "Fields"

The shop order master file on magnetic tape is the basis of the financial data processing system. Inasmuch as central compact storage of complete financial data is the underlying principle of the integrated computer system, a basic understanding of the shop order master file is necessary to an understanding of the complete system. This file contains over eight thousand individual records stored on a single reel of magnetic tape. It contains a record of each shop order, sub-ledger account and balance sheet control account in the department. The records are maintained on the tape in a sequence which permits weekly and monthly reports to be extracted as a finished product, with no sorting required. This is an important consideration in any tape-operated computer, since sorting is one of the least economical operations to perform on large machines of this type.

Each individual unit record in the system contains a number of fields. Each record contains the same fields and these fields are consistent in length and content, even though some of them may not be used for all types of records included in the system. These fields fall into two general type categories: indicative data and statistical data. Information stored in the indicative data fields includes such items as requisition number, shop order number, appropriation or cost estimate number, shop order title or description, and budget data. Also included in the indicative fields are a number of codes which the computer will interrogate when processing the record to determine which overhead rate should be applied to direct labor from a table of overhead rates stored in its memory. Statistical fields include current-month accumulations of charges by classification of the charge. For example, material, various classifications of labor, overhead and billing liquidations are each accumulated separately.

Year-to-date amounts and total-to-date are also accumulated by the same classification of charges. Unbilled balances by billing classification are also maintained for each shop order and account. As a result, all data required for general accounting, cost accounting and some elements of purchasing and orders-received accounting are included in the master file tapes. All registers, reports, billing and control totals are extracted from data summarized in the master tape on a weekly, monthly or annual basis.

Journal Entries Superseded by More Comprehensive Information

Monthly journal entries have been replaced by transaction records in the form of punched cards which are prepared currently for all financial trans-

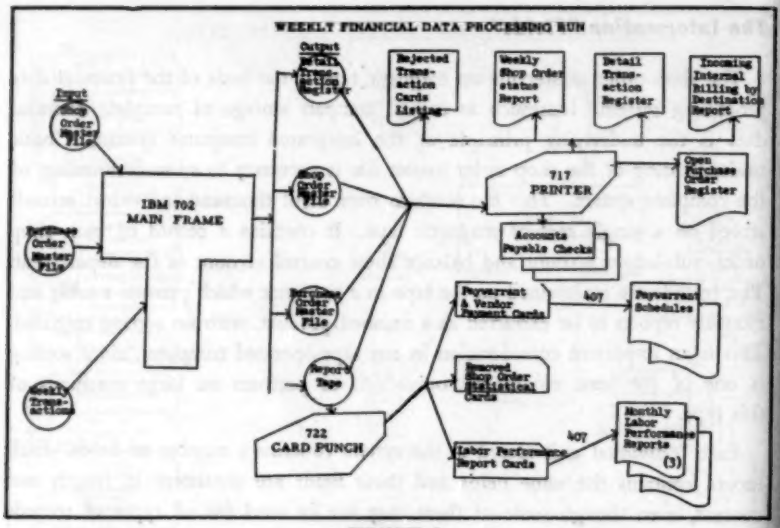

EXHIBIT 2

actions. This has completely eliminated the journal entry system of accounting in this department, since it is no longer necessary to journalize charges in order to post to the individual records. The computer posts all details affecting an individual record at the same time, instead of accumulating all charges of a particular type in journal entries for posting to the records affected. Transaction code numbers replace the former journal entry numbers but accomplish considerable more than journal entries did under manual or mechanical systems.

Exhibit 1 shows the manner in which transactions for a given week are converted to tape for processing by the computer. It will be noticed that file maintenance type changes bear the lowest transaction numbers. Since weekly transactions are put on tape in transaction number order, this means that any file maintenance changes, such as the opening or closing of a shop order, will enter the computer before any changes occur in statistical data. For example, a shop order may be opened in a given week and charges booked to it. In addition, the transaction code indicates to the computer the exact routine from a library of routines stored in the computer's memory, which should be selected for the processing of a transaction. The transaction code tells the computer what changes need be made in the shop order master file or updates the purchase order master file or specifies the reports into which the detail card must be incorporated or establishes any special accumulations which are to be accomplished for control purposes.

How Exceptions Are Automatically Disclosed

At the end of each week, the transaction cards are converted to a weekly transaction tape which, along with the weekly labor distribution obtained as a by-product of a prior payroll run, is used to update the thousand records contained in the shop order master file and, at the same time, produce current weekly cost and control reports. This is illustrated by Exhibit 2. The exception principle is followed in determining which shop orders and accounts are to be reported in any week. If a manager, supervisor or foreman does not desire a report on a specific shop order, he so indicates and this shop order account is not reported to him until he asks that it be included in his report.

In the purchasing department, as each order is placed a by-product punched card is automatically produced. Information in this card includes the shop order number, purchase order number, and dollar value of the order. These cards are converted to a purchase order master file on magnetic tape in purchase order number sequence. When the bill is received for payment, the purchase order number and the gross amount of the bill is converted to magnetic tape and fed into the computer along with the purchase order master file. The computer prepares checks and pay warrants covering all purchase orders for which material has been received and invoices are on hand. As the computer processes the payments to vendors, it automatically calculates the net amount of the bill and the amount of the discount. Payment will not be made unless a purchase order is available in the purchase order master file. This establishes a check against duplicate payments. In addition, if the net amount of the invoice exceeds the amount of the order, an automatic message is typed out on the typewriter on the computer console to indicate this fact.

As output from the weekly computer run, a shop order status report is prepared by the computer indicating the charges incurred during the week by classification of the charge, total-to-date expenditures and, on any account with a budget or authorized amount, the unexpended balance is printed. A weekly report is prepared for each of the more than one hundred units on the foreman and line supervision level.

Each week the computer automatically provides a voucher comparison report for both weekly and monthly paid employees as direct output from the payroll run. These reports show any excess or shortage of vouchers for each employee, both weekly and monthly, based on clock card hours or an assumed forty hours if no clock card has been submitted for the week. Vouchers are not required for any employee whose time is normally charged to a standard overhead order, since the computer automatically distributes this time to the standard expense account in the employee master file.

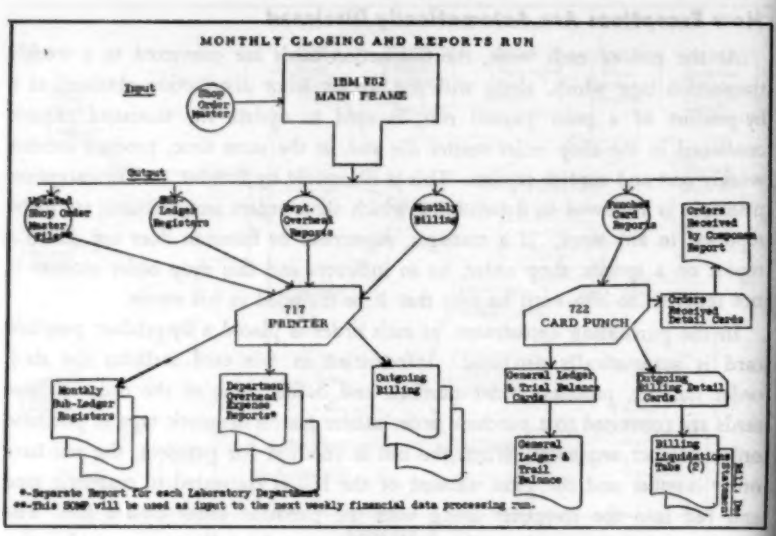
MONTHLY CLOSING AND REPORTS RUN
Input
Shop Order Master
IBM 702 MAIN FRAME
Output
Updated Shop Order Master File
Sub-Ledger Registers
Dept. Overhead Reports
Monthly Billing
Punched Card Reports
Orders Received by Component Report
717 PRINTER
722 CARD PUNCH
Orders Received Detail Cards
Monthly Sub-Ledger Registers
Departmental Overhead Expense Reports*
Outgoing Billing
General Ledger & Trial Balance Cards
Outgoing Billing Detail Cards
General Ledger & Trail Balance
Billing Liquidation Tabs (2)
*-Separate Report for each Laboratory Department
**-This BOMF will be used as input to the next weekly financial data processing run.

EXHIBIT 3

Advantages Realized

One of the major advantages of the integrated system has been the early closing of the department's books. On the first Tuesday following the close of a fiscal month, the books are completely closed by a special run on the computer. This is illustrated by Exhibit 3. This run prepares a trial balance, a general ledger, overhead reports and an orders received report by each component of the department. All charges, including labor incurred in the last week of the month, are on an actual basis and are not accrued. Therefore, the trial balances and sub-ledgers include all of the charges distributed to several thousand shop orders. Under this system, if desired, the books can be completely closed weekly. During the conversion months of April, a weekly trial balance was actually prepared by the computer to localize any possible errors made as a result of unfamiliarity with the new system.

A monthly sub-ledger register is produced from magnetic tape, which includes all of the sub-ledgers supporting general ledger accounts. These include plant equipment, engineering orders, raw and in process inventory, overhead, plus several that are special for the department. This register eliminates the need for any manual posting formerly required. During the monthly closing run, all charges incurred against orders which may be billed during the current month are automatically billed out. Invoices are automatically prepared

by the computer, including appropriate classification of charges for statistical purposes. Most of the billing of this department is done internally to other departments within the company and the computer, in addition to providing the bills, also provides billing schedules by company destination. The integrated system results in the issuance of billing two to three weeks sooner than had been done previously.

During the closing run, an overhead report is automatically prepared for each component in the department. These reports show expenditures against each overhead account on a current month and year-to-date basis. In addition to expenditures, the overhead report also contains budget analysis. The computer calculates the variable budget based upon adjusted applied labor for the month. Performance against the calculated budget is shown as a percentage. Audit symbols appear opposite the overhead account when expenditures exceed the calculated variable budget amount.

The financial data processing system has fulfilled all of the basic objectives set for it and is running successfully on the computer. It has permitted much earlier closing of the department's books, more current billing of the department's books, more current billing of the department's expenses, much earlier reporting to management and, thus, appreciably better management control through financial operation. It has resulted in an appreciable saving in clerical and machine accounting costs.

THE BROAD, FAST PICTURE WHICH ELECTRONICS CAN PROVIDE

E. W. BUGE

Electronic devices and computers will bring about a radical change in cost accounting. For example, current labor accounting in our plant now requires that the operator fill out a time card showing the following information: clock number, department, order number, time started, time stopped, and production count. This information is then turned in to the payroll and production departments for production count or inventory recording and payroll computation. This is cumbersome enough but suppose that a machine breaks down in the plant and we have an operating problem in addition to an accounting one. The operator has to walk to the central time station and report the incident. A maintenance man next has to be located, dispatched to fix the machine and then has to return to report the completion of the job.

Now let us approach this process from an electronic standpoint. First, each unit of production will have three basic recording components, a transmitter, a phone, and a counter. At the start of the job, the operator will dial the order number and her clock number. At the central dispatching station, the receiver records in punched tape the date, time, clock number, and job for this unit. At the end of the job, the operator can punch a button or dial a code indicating partial or final completion. Immediately the receiver records the elapsed operating time, scans the production counter and punches the quantity into the tape. Feeding the tape into a computer will give the direct or crew cost per unit together with full payroll information and inventory data.

In the event of a machine breakdown the operator dials the stop code which gives the production data. Next she phones the dispatching center for maintenance help and instructions. The maintenance man, upon arrival at the machine, can dial in the start of repair time opreations, cause of trouble, and completion of repair. He can also phone the dispatching station to report for new instructions and the return of the operators. It is readily observed that the labor cost of down-time and a down-time report by machine are available practically by the hour, with automatic accumulation of data for longer periods of time.

Carried further, it can be said that, as a by-product of our electronic recording system, we can have available an up-to-the-minute report on factory operations anywhere in the plant, or for that matter in the world—via teletype! In short, computers and electronic recording of facts promise not only large clerical savings but also much higher operational and managerial efficiency. Inventories and production will lose their tendency to pile up. Management can plan ahead more effectively.

To receive and act on accurate information is the essential function of every management. As high speed computers permeate commerce, radical changes will take place in accounting methods. The diverse memories and input-output devices will eliminate the present paper records. More facts will be stored on tape or in computers. All record-keeping will be centralized. Payroll, cost distribution, material control, production scheduling, cost, and general accounting will be brought together in one location. The basic training of the cost accountant in the complex operations of the business gives him a preferred place in the electronic revolution presently occurring in business. But he must act to take advantage of it.

Production Control System For a Gray Iron Foundry

By ROBERT W. STOCKER

INVENTORY LOSSES, shipping shortages, and erroneous cost figures recently persuaded us that production reporting should be as modern as foundry equipment. A complete survey was ordered. The results of this survey produced the following list of requirements for any system that was to be adopted.

1. Accurate and complete incentive payroll information for the core room and the molding room employees. (The remainder of the shop was on hourly basis.)
2. Comprehensive scrap reporting by production lots, indicating kind of defects, responsibility, and department.
3. Count by part number of castings received after "shakeout."
4. Firm figures on "ghosts" (unfilled molds) by item and lot.
5. An early knowledge of amount of "make-up" required to make complete, prompt shipments, reducing number of back orders.
6. Dependable count of pieces receiving in shipping room.
7. Compilation of output and performance of grinders for future possible incentive plan.
8. Elimination of frequent physical inventories.
9. More accurate cost reporting based on substantiated evidence.
10. Avoidance of undue expense and complicated and bulky records.

The system which was built to these requirements has been operating successfully. Production initiated each day is considered one lot. All subsequent work or variances must be charged to its lot. Working from this we proceeded in the following manner:

1. Created a count control station.
2. Developed three sets of forms to order parts made and to identify parts by production lots.
3. Assigned one person as checker to be responsible for adherence to the system by all personnel.
4. Established thorough and all inclusive scrap reporting.
5. Developed one report that completely summarized each lot.

ROBERT W. STOCKER is Secretary-Treasurer of the L. A. Darling Company, Bronson, Michigan. He is immediate past president of Lansing Chapter. Mr. Stocker is a graduate of the University of Michigan's School of Business Administration.

Strategic Location of Count Control

In creating the count control station, our aim was to locate it as close to the molding operation as possible so that it would serve as a check on the piece count turned in by the molders. The nearest practical location proved to be immediately after the cleaning operation in the cleaning department. The castings are not touched between the molding operation and the cleaning operation. Therefore, there was no possibility of losing castings due to handling between the molders and the count control station and any differences that developed could be considered to indicate either inaccurate count by the molders or ghosts (unfilled molds). This shortage information is supplied to the foreman immediately after the production run and enables him to make up the shortage on the next day's run. Also, the information is fresh enough for him to determine the cause of the loss and take possible corrective measures. Many patterns have been changed after determining that the percentage of losses due to ghosts has been found to be high. Immediate correction is made of the molders counts.

The location of the count control center was also greatly influenced by the fact that a group of workers sorted and checked the castings at this point.

Departmental Production Forms

The next step in organizing the new system was the creation of three new forms for use in putting information into the hands of the foremen and for use in getting performance information back into the office. It was decided to give each department concerned—core department, molding department, cleaning and shipping department—a separate form but containing the same basic information so that all the forms could be created at one time by use of addressograph plates. They are keysort-type cards with small print difficult of further reduction for illustration here. The core department ticket is a four-part carbon spot form. One ticket per part number is issued to the foreman as his authority to make the specified number of cores. If the job is large or more than one employee will work on the job, the number of tickets will vary. The foreman issues the tickets to his men at the time he assigns them jobs for the day. At the end of the working day or as the assigned job is completed, the worker records his clock number, pieces made, balance to be made, and the hours worked on the part and returns the form to the foreman for his approval. At the end of the shift, the foreman checks and approves the tickets. He detaches the top copy and retains it for his departmental files. The second copy he places on the tray of cores for identification in the molding room. The third copy goes to the production control department to be recorded, showing the number of

cores made and available for molding assignment. The last copy is sent directly to the payroll department and is later used for cost verification of payroll time as history study for future incentive plans.

The molding department set is also a four-part form. The production manager sends one of these forms to the molding foreman for each part number ordered. This procedure is followed unless it is a large job that will require more than one molder and then he will send only as many as there will be molders working on that part number that day. The foreman sends the top copy to the clean and sort department the first thing in the morning as notification that the job has been started in production. Upon completion of this assigned order, the molder records his clock number, hours worked, number of molds made, and his molding station number. The tickets then are picked up and sent to the payroll department. The pay is computed, the third copy returned to the employee as his daily pay record and the hard or fourth copy stays in the payroll department for accumulation of payroll and cost analysis.

The clean and ship set consists of a two-part form. Several copies of this form are made and sent to the count control center as one copy is put into each cart containing like items. The counter records on the form the number of pieces contained in the cart, tears off the first copy and sends it to the checker for recording on the daily production record. The hard copy goes with the cart through the grinding and into the final inspection department. It is by the date on this card that production flows through the remaining operations in an orderly manner. The grinders will not grind the castings in a cart if the card indicates it is of a later date (lot) than others in the department.

Duties of Production Checker

The general duties of the checker are to see that all phases of production and all personnel are functioning in such a way as to be conducive to accurate production control. Should the unusual situation occur, it is his duty to investigate, determine how it will affect his reporting, and notify his superiors if it is such that he cannot resolve the problem without undue conflict or confusion. It is not his prerogative to dictate to the foreman and the workers. However, it is his assigned duty to question and to delay any load of castings for recount or identification if he feels this is called for. The first specific duty of the checker is to be sure that the counts reported are correct and conclusive—his second important duty is the preparation and distribution of the Daily Production Record shown in Exhibit 1. It is through this form that the entire production control information is consolidated into one complete picture. While all the

DAILY PRODUCTION RECORD Date____ Code____

Part No.	Qty. Ctgs.	Molders Clock Number	Molds Made	Castings per Mold	C-S-C Count	C-S-C Scrap	Ghost	Grinders Scrap	Grinders Prdctn.	Final Insp. Scrap	Final Insp. Rework	Rec'd in Shipping

EXHIBIT 1

PERPETUAL INVENTORY LEDGER

Part No.		Customer's Order No.			Shop Order No.			Customer's Name		
Routing			Pcs. on Plate	Unit Wt.	Acknowledgment			Price		
Date Order Received	Number On Order	Date Made	Number Made	Number Scrap	Number Good	Total Good	Date Shipped	Number Shipped	Number On Hand	Balance To Ship

EXHIBIT 2

other forms are necessary for the conveying of instructions and information, this is the report that persuaded the plant manager and general manager to put the system into effect.

The first five columns are filled in when the top copy of the molding set is received at the count control station. The amount on the first copy of the clean and ship ticket is recorded in the clean-ship count column. The inspector furnishes the checker with the scrap report immediately after the last load of one production lot and before the first load of the next production lot is processed through the count station. The sum of Columns 6 and 7 deducted from Column 5 indicates the number of ghosts occurring between the molders and the counters. As soon as this calculation is computed, the report is delivered to the production manager. He checks over the report to ascertain whether or not a make-up run will be necessary on any item. He also watches the ghost column to determine items of excessive losses to be investigated.

The scrap is segregated in the grinding room and is reported as part of the over-all plan. The checker controls the flow of work through this department to be certain that each lot maintains its identity. As the final inspectors come to each item, they obtain a count of castings reaching the grinding department. Should the count at this point vary from the initial count, the checker immediately makes an investigation.

Exhibit 2 is the record that the production manager keeps. For every new order received, a new sheet is filled out and placed in a loose-leaf binder by customer. All like part numbers for this same customer are placed on the same rings, with the oldest order on top. By this method, orders are not placed in the shop on a new order until the old order is completed.

Essential Information on Simple Forms

The production control method outlined in the preceding pages has given our production manager accurate tools to work with for scheduling production, pinpointing production problems, and making timely deliveries to our customers. In addition, we are receiving valuable cost information for future pricing, as well as knowledge as to our performance on jobs as they are produced. These results have been accomplished without additional personnel, which was made possible by the simplicity of the forms and a regrouping of work assignments.

Problems of the Captive Gray Iron Foundry

At times in the past detailed costs have been of minor importance in connection with foundry pricing problems, especially in the case of the captive foundry, since the value added by subsequent machining operations has been of much greater importance than foundry cost in the total cost picture of the company's end-product. The type and design of castings, the size of production runs, and the relative scheduling of production have been far more dependent upon machine shop requirements than upon influences which might be exerted by the requirements of close foundry management alone.

Some developments of recent years have combined to upset this simple and comfortable cost accounting picture. More and more parts of finished products have come to be fabricated from steel and aluminum and the relative proportion of forgings, die castings, and semi-steel castings has risen. In the production field, increasing mechanization of materials handling and other improvements in foundry production technology have expanded the potential productive capacity of the foundry itself. These factors have steadily reduced the volume of gray iron work available to the captive foundry and brought on a condition of over-capacity, both in equipment and necessary overhead organization.

As a result of this decreasing volume in the foundry, two fundamental problems have been raised, that of expansion of output, either by solicitation of outside casting work or taking on other machine shop work, the basis of which is gray iron castings or, on the other hand, that of dispensing with the foundry altogether and purchasing remaining castings requirements outside.

Moreover, the replacement of cast iron with other materials has not been uniform in the various end-products of the machine shop, with the result that the overall iron cost per pound has become increasingly dangerous for use in costing for product pricing purposes. The company has had to face constantly increasing competition for the replacement and repair parts business arising from the wearing out of components of its end-products. The manufacturing of individual repair parts to sample has been a fertile field for relatively small competitors to enter and to flourish. In this area particularly, the use of overall per pound costs as a pricing guide is likely to result in underpricing some items and overpricing others. If such a situation long continues, the profitable replacements are supplied to customers by competition and the expensive, complicated items are made by the company and sold at an inevitable loss.

ROBERT W. CORSON

Machine Accounting Control for Fixed Assets

by ADOLPHE J. PETERS

THE ADVANTAGES OF TABULATING machines are easily adapted to the control of fixed assets. Seven steps are involved in this control whether done clerically or electrically. These steps are using machine terminology, collecting, coding, sorting, computing, summarizing, verifying and reporting. Exhibits 1, 2, and 3 relating to records kept, chart of accounts, and classifications are sufficient for background.

Collecting the Facts

Collecting facts about the asset is the first step in our control. Tabulating equipment (and electronic equipment, even more so) allows us to combine information at the source, for incorporation on the tabulating card. This operation is initially a manual operation from packing slips and/or shop orders. The asset and tabulating card are "installed" at the same time. Tabulating cards for fixed assets can be initiated at receiving or installation. Cards prepared at installation are better because assets, such as company-made, are not picked up on the receiving report. Maintenance records are also originated at this point in the company's paper work. Often, in the case of shop-made assets, the tabulating cards are made from the maintenance files, and maintenance records are separate from the tabulating cards for fixed asset control. The basic information needs for the life of accounting for the fixed asset.

1. Generic name
2. Account symbol
3. Inventory number suffix
4. Maker's serial number and name
5. Cost center
6. Maker's model
7. Date of purchase
8. Inventory cost
9. Depreciation rate
10. Depreciation to date
11. Elapsed months
12. Remark space

The name by which each item is recorded is selected on the basis of the generic nature of the item rather than the complete functional nature. Only maintenance records need have the complete functional name. For example,

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ADOLPHE J. PETERS is an accountant with the Pitney-Bowes Company, Inc., Stamford, Connecticut. He has been with Pitney-Bowes for several years in varying positions of responsibility, including cost and general accounting. Mr. Peters is past associate director of the *Greenwich-Stamford* Chapter.

RECORDS KEPT UNDER USUAL ACCOUNTING FOR FIXED ASSETS	
Request	Cost Dept. Detail ledger sheets
Estimate	Inventory numbering detail
Purchase order	Insurance detail
Receiving Reports	Plant layout detail
Installation Orders	Budget detail
Vendor's Invoice	Property control
Voucher's Payable	Report to Management:
Payroll (i. e., for building or installation)	(a) changes in fixed assets
Tool make Orders	(b) monthly depreciation
Special Shop Orders	Independent appraisal detail records
Maintenance Cards	Depreciation detail
(a) Office - machines & furnishings	Tax detail
(b) Factory - production direct & indirect	Factory cost center
(c) Electrical heating & plumbing	Move orders - Installation or move
Scrap reports	

EXHIBIT 1

"milling machine" should be used instead of "Wilbur & Garvey 4 x 9 Hydraulic Norwalk Universal Semi-Automatic Thread Milling Machine." This pattern establishes a brief standard description for each item and permits a ready understanding of equipment of common characteristics. This part of the system allows for "use subclassification."

The account symbol is obtained from the purchase order as indicated in the company chart of accounts. Each classification can have subclassifications which may depreciate at different rates. For example, class of machines symbol No. 50 may have 5011 for defense machines, 5012 for production machines and 5013 for service machines. General equipment may have 5111 for machine equipment; 5112 for portable equipment (i.e. scales and fans); 5113 for stationary equipment (i. e. shelves and benches); 5114 for factory truck equipment, and 5115 for general service equipment. The tools are classed according to use on models or general products. Office mechanical equipment items (types and brands by serial numbers) are according to use and location. Furniture and fixtures class is divided by, location, office and factory. Welfare equipment can have medical, cafeteria and industrial relations sections. Buildings divide into use and improvements such as heating, electrical, air conditioning and structure.

CHART OF ACCOUNTS FOR FIXED ASSETS			
Account Symbol	Classification	Account Symbol	Classification
50	Machines	55	Furniture & Fixtures
51	General Equipment	56	Automobiles & Auto Trucks
52	Research, lab. & Dev. Equip.	57	Welfare Equipment
53	Tooling	58	Buildings
54	Office Mechanical Equipment	59	Land

EXHIBIT 2

The inventory number is suffixed to the account symbol as the installer chronologically installs the asset. A number is given to:

1. Each self-contained item classified as the complete machine. Accessories and attachments including component parts are part of the complete machine.
2. Each building although it may have common walls or floors. These numbers may be incorporated into the chart of accounts as subaccounts.
3. Each complete item of equipment, which may be stationary, movable, or portable and normally has salvage value for resale. Hard-to-inventory equipment such as shelves, benches and some portables, as well as the hard-to-control equipment, are numbered by composite subclassifications.

The maker's serial number is recorded from the asset. The installer is cautioned to look for the machine's number and not to confuse it with that of the motor and switch which are needed for the maintenance records. The cost center is determined from the foreman or manager of the group receiving the asset and the center number agrees with the manual of accounts.

Additions to equipment are given the same account symbol and inventory number as the asset to which they are to be a component.

The cards are collected by the cost department for verification prior to tabulating machine preparation. The cost department fixed asset clerk ascertains date of purchase to agree with vouchers payable and posts it to the remark section of the card.

Coding, Sorting, Computing

The purpose of coding is to create a numerical reference consisting of a selected number of digits, by which items are drawn together into special groupings or classes for accounting purposes. This, in turn, permits uniform nomenclature and continuity of listing on time reports, asset lists, and depreciation schedules and affords a methodical means of conducting accounting work. Use of company inventory numbers is preferred to the manufacturer's serial or catalogue numbers. As already noted all company numbered items are grouped under general classifications and each is assigned account symbols consecutively. The chart of accounts and the directory of fixed assets numbers are designed for machine coding as well as for type written reports. The coding information is given to the head of the tabulating department.

All the facts needed for the fixed asset card are basic. These items are arranged to be key punched so that sorting and reports for depreciation and cost can be summarized by each one. Cost savings become apparent when sort-

CLASSIFICATION INVENTORY - MACHINES

Account Symbol Inventory Number	Description	Account Symbol Inventory Number	Description
5011-1	Milling Machine	5011-15	Screw Machine
5011-2	Washing Machine	5011-16	Profiler
5011-3	Buffing Machine	5011-17	Jig Borer
5011-4	Power Press	5011-21	Arbor Press
5011-11	Engraving Machine	5011-22	Tumblers
5011-12	Shaping Machine	5011-23	Comparator
5011-13	Drill Press	5011-25	Impact Machine
5011-14	Lathe	5011-26	Grinding Machine

EXHIBIT 3

ing is available. Replacement of assets includes less guess work when cards are sorted for depreciation by elapsed months. The result is savings. Sort by cost centers reduces idle machines. Sort by depreciation rates facilitates computation of book and tax provisions.

Programming of tabulating operations includes allowance for computations. This involves use of the figures for cost, the depreciation rate, and the elapsed months. On each card will be the rate of depreciation required for classification. Inventory numbered accounts are computed on each tabulating card for the asset. Composite accounts are depreciated on summary cards for monthly conditions. Cards of fully depreciated assets are not computed. Cards of such items, those written off in composite accounts and those disposed of by item, are taken out of the card file in computing depreciation.

Summarizing and Verification

The tabulating cards for all assets may total anywhere from two thousand to four thousand cards and occupy from fifteen to forty-five linear inches. A complete asset and depreciation report would take one hour from tabulating card verification to printing the report. The machines sort to the several account classifications. Summarizing on tabulating equipment is totaling cards of groups after sorting and automatically producing a card for the totals of the several cards. This can be done by asset number for several additions, or by cost center, accounts, or by time periods.

When a tabulating card is devised and prepared, it becomes a permanent record needing verification. How the tabulating cards are verified is largely determined by the volume of cards and type of reports to be rendered. Personnel make mistakes which are corrected at the point of the tabulating card verification. The average operator will not make more than one fourth of one per cent error in the initial preparation. Sight check vertification can be used on printed cards and when the code is known. Predetermined totals also are

used to verify. The machine may be used to compare duplicate cards made by different key punch operators as a verification. Tabulating cards are prepared from the collection of facts, coded, sorted and summarized for verification after each step. Each monthly group of cards is verified to vouchers payable total and payroll when indicated. The account symbol-inventory number is placed at the earliest time to aid the maintenance staff in tagging the correct item and controlling each installation and maintenance from the earliest possible point.

Returns, adjustments, or other subtractions are credited using separate cards and the account symbol-inventory number applicable. At any report period, including the fiscal year end, several cards for one account symbol-inventory number are summarized to one card. The summary card is verified and is used for the life of the item.

Detail and Summary

We have collected the basic information. We have coded this information by the classification. Key punch operators have prepared tabulating cards in accord with the program. Now we approach the area for which all the foregoing is, in a measure, preparation, i.e. reports. The depreciation summary is a basic report and one of the objectives in programming fixed assets for machine accounting, and hence, is a good example to examine. Let us see how it is affected by a new acquisition. Suppose the company buys the Wilbur and Garvey Milling Machine. The installer, by examining the machine and the receiving report, adds to the remark section the generic name, "milling machine." The following data apply:

Account Symbol	50—	Maker's serial number	27274
Inventory number	—1291	The cost center	—2000

The cost clerk receives the card and adds the purchase date and cost (from the invoice and shop order) and also depreciation rate. He verifies and sends the card to the machine programmer. The key-punch operators prepare the card for the milling machine No. 1291 with other cards according to the approved design of the programmer. After verification, the No. 50-1291 and other cards are automatically sorted to eliminate completely depreciated items in sorter. Then the card for the new item and others still depreciating are automatically sorted for accounts and depreciation rates. The depreciation is computed automatically and, on older acquisitions, added to depreciation taken in prior reporting periods. Another reporting period is also added to elapsed months. If depreciation exceeds cost, the card is automatically totaled for cost.

The exact difference in the depreciation taken previously and the inventory cost is done by the machine automatically. The machine automatically prints by accounts the account symbol-inventory number, generic name, maker's serial number, date of purchase, costs, cost center used, depreciation in dollars and cents, the depreciation to date, and the elapsed months since purchase.

Summary cards are made for each account which are totaled for the printed report. The total of the depreciation rate column in dollars and cents supports the journal entry for depreciation. For use in other types of reports, journalized cards for assets still depreciating are automatically reproduced each month. This automatically picks up additions, drops disposals and deductions, and shows the up-to-date depreciation balance on the current set. Since a new set of cards for depreciable assets are made monthly, disposals of fixed assets eliminates adjusting entries of inventory cost or depreciation at later periods. Just read the card and make the journal entry desired. You are always in balance. The cost of reproducing is easily cheaper than having a clerk spend time computing, totaling, and adjusting what the machine can do more economically.

When the tax department requests a report with requirements special to its needs, the machine programmer blocks out irrelevant material and the tax report is automatically reported from the same tabulating cards. Budgetwise, the assets are sorted by cost center and the fixed asset budget is verified. For insurance appraisal, the cards can be sorted by building and the basic information automatically printed. The maintenance department can use a cost center and building summary. Replacement estimates will be supported individually and by groups more quickly. The production department needs the up-to-date locations for scheduling and planning methods. Machines-in-use for production is another compelling use of this tabulating card.

Basic Principles Restated

Tabulating machine accounting is a method of doing old jobs and new jobs better. Fixed assets accounting using machines has advantages in time and money savings and accuracy. The basic steps of machine accounting are collecting, coding, sorting, verifying, summarizing and reporting. Proper *control* of fixed assets is more economically obtained using the best special machines available.

Satisfying Your Company's Need for Capital and Employing it Effectively

by PETER M. CHIUMINATTO

THE CAPITAL WHICH we have to work with consists of working capital in the limited sense of net current assets and also of the slower-moving items which, nevertheless, are very relevant to current operations. We need to know that we have the right amount of both if we are to avoid the following hazards:

Too Much Capital	*Too Little Capital*
1. Cannot earn proper return.	1. Cannot discount bills.
2. Turnover ratios used for management control, impaired.	2. Operations must be conducted on smaller than normal inventories, which causes costs to rise.
3. Risk of excessive inventories and expenditures for fixed assets.	3. Lack of best equipment for manufacturing.
4. Unfavorable comparisons with other companies.	4. Credit rating is not good.
5. Value of stock will not reflect the excess capital.	5. Lack of dividends, causing dissatisfied stockholders.
6. Estate valuation problem.	6. Risk of insolvency.

Behavior of Assets With Sales Volume

Before we can intelligently discuss the methods of creating capital, we must know how much capital is needed. For this purpose, capital, whether it winds up in current assets, current liabilities or in the other asset sections of the business, must be divided into two parts, variable and fixed. Without such a division, we would never know how much capital we need to work with at varying levels of sales volume. Further, the kind of capital needed, whether fixed or variable, determines the sources from which such funds would normally be raised. Variable working capital is that part of the capital which varies almost directly with sales volume. Fixed working capital is that part of the capital which does not vary directly with sales volume.

PETER M. CHIUMINATTO is Vice President and Treasurer of the Charmin Paper Products Company, a subsidiary of Procter and Gamble. He is a past president and one of the organizers of the Northern Wisconsin Chapter and a Past National director of N.A.A. Mr. Chiuminatto is the author of many articles and a co-author of finance handbook published by Prentice-Hall. He was the recipient of a manuscript Certificate of Merit in 1956. Mr. Chiuminatto is a lecturer at Marquette and the University of Wisconsin on financial subjects.

How does one go about the problem of dividing the company assets into fixed and variable? The easy way is to draw a graph similar to that in Exhibit 1. This graph is similar to the ones usually drawn for separating fixed and variable manufacturing expenses. Along the bottom of the graph, we have the annual sales volume. Along the left side, we have the dollars indicating the total assets used in the business. Now, by plotting the dollars of assets used at varying sales volume of past years and then drawing our line through a point of most contact, we conclude that 28.4 per cent of our assets vary with sales volume and that we have a fixed investment of $650,000. Readings from the graph indicate that the capital needed for given volumes of business are as follows:

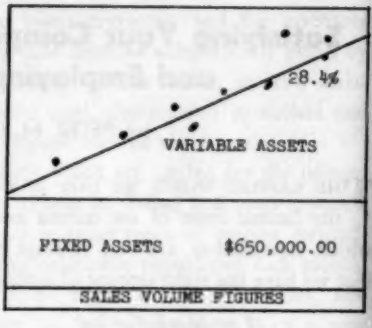

EXHIBIT 1

Business volume	Capacity	Fixed capital	Variable capital 28.4%	Total capital
1,200,000	80%	650,000	340,800	990,800
1,500,000	100%	650,000	426,000	1,076,000
1,875,000	125%	650,000	532,500	1,182,500

This, as has been stated, is the easy way. The hard way is to take each asset on the balance sheet and give it individual treatment because, if this is not done, its particular behavior will be hidden in the over-all picture. Such special behavior may be very important in the particular forecast or presentation. It would be especially important if an expansion program were contemplated. This might easily reveal change in the fixed portion of the capital, which remains constant only within certain limits of production. In drawing the individual asset charts, certain rules apply. If the asset tends to be highly variable, treat it as variable. If the asset tends to be highly fixed treat it as fixed. If the asset has strong elements of both fixity and variability with sales volume, i.e., what we call semi-variable, break it down into two or more accounts and classify the elements accordingly. In point of fact, there is no such thing as a truly variable or truly fixed asset, except under certain conditions and for a certain period of time. We do the best with what we have. An answer which is 85 to 90 per cent correct is better than no answer at all.

Raising Capital in Line With Prospective Use

Our next problem is to find how we are going to raise the desired amount of capital. In discussing the sources through which we raise it, let us keep in mind one important principle. Funds required should be raised in accordance with the use to which they are to be put. Money raised for variable assets should be raised from sources which can be increased or liquidated as required from time to time and as business conditions change, so there will be no excess capital or permanent cost to the business beyond the time the funds can be used. Hence, for variable assets we should raise our money from:

1. Trade creditors
2. Short-term bank loans
3. Depreciation
4. Reinvested earnings

Money raised for fixed assets should be raised from sources which do not expect payment for some time in the future or, at the most, annual or periodic payments which are not cumbersome for the business to meet. For fixed assets we should raise our money from:

1. Common stock
2. Preferred stock
3. Long-term bank loans
4. Bonds
5. Depreciation
6. Retained earnings

With the exception of depreciation and retained earnings which appear above as sources of funds for both fixed and variable assets, it is best to adhere to the principles of separate sources for these two categories for the simple reason that, if you raise variable capital by long-term means, you are saddled with a permanent and long-term cost beyond the time of need and with a continuing effect on future profits. And if you raise fixed capital by short-term arrangements, it will be impossible to meet your obligations.

These sources of working capital are the usual ones. There are other methods of raising funds which, ten years ago, would have been considered emergency measures to be used as a last resort. However, time marches on and, as economic conditions change, what was considered not good financing has now come to be considered standard procedure, primarily through use by some of the largest industries in the country. These additional sources are:

1. Commercial finance companies: Financing arrangements with a commercial finance company are usually on a secured basis involving the sale or assignment of accounts receivable or the pledge of inventories or both. Periodical liquidation is not usually required and loans outstanding may be fairly continuous over long periods of time against revolving security.

2. Factoring: Factoring is a specialized type of credit offered by a privately-owned commercial finance company that engages in the business of purchasing accounts receivable without recourse on the seller.

3. Commercial paper: To supplement the use of direct bank credit or for other valid reasons, a fairly large and well-established business may elect to finance some part of its seasonal or temporary working capital requirements in the open market by selling its short-term unsecured notes to a commercial paper broker.

4. Small businessmen's associations: Direct loans or indirect loans through a bank which assumes part of the risk may sometimes be obtained in this way. Such funds are available only if investigation shows the business is entitled to credit but is unable to obtain its requirements through normal channels.

5. Field warehousing: Under this form of financing, inventory can be used as loan collateral while the goods remain on the borrower's premises. Since a bonded field warehousing concern takes legal custody of the inventory, banks and other lenders which otherwise could not handle these loans are now able to do so. Particularly where sales are seasonal, companies find this is a good way of providing for sustained production throughout the year.

The Lease as a Conservator of Capital

For many companies the relative advantages of buying vs. leasing capital assets have changed in recent years. More and more kinds of industrial and other equipment are becoming available on lease arrangements. The latest to enter the field are the machine tool manufacturers. You can now get a boring bar, lathe or any machine tool you desire on a rental basis. Any final decision on whether to lease or purchase capital assets must be based on three decisions:

1. How will it affect the cash position of my company?
2. How much will the final cost be for the long pull?
3. What effect will the arrangement have as compared to the 1954 tax law which permits new and rapid depreciation?

Sale and lease back of property is another newly-popular device. This results in an immediate lump-sum increase in working capital represented by the proceeds of the sale at its current high market value less the tax, which frequently is at capital gains rates on the profits realized. There is a substitution of a rental deduction for the otherwise available depreciation allowance.

Suppose that a building purchased in 1920 for $40,000.00 is now worth $80,000.00 and is fully depreciated. The company needs $60,000 additional working capital and the building is its only means of obtaining it. No one will loan over 50 per cent of the value or possibly $40,000 and this is not enough for the needs of the business. Lease-back is, therefore, decided on and the the building is sold for $80,000. The profit realized is $80,000 because the structure is fully depreciated but, after a capital gains tax of 25 per cent or $20,000, the net proceeds of $60,000 are available for the business. Further, there was no current tax deduction for depreciation but, under the new arrangement, there is a deduction for the rent paid to the purchaser. If the purchaser demands 6 per cent as a rental fee, that is only 3 per cent after tax saving is considered, and there is the further offset of earnings on the new capital.

Radical Methods of Raising Emergency Capital

In smaller businesses, it is sometimes impossible to raise the funds needed by the orthodox methods or even by the emergency methods already discussed. In such cases, there are still a few extreme methods not usually recommended but applicable on the principle that, when the ship is sinking, everything should be done to keep it afloat. You can still raise working capital by:

1. Pledging of collateral by the business or officers or directors or partners.
2. Endorsements and guarantees of officers and directors.
3. Subordination of debts due the principals or officers.
4. Special dating on invoices.
5. Asking for advance payments on contracts, especially where the process period is rather lengthy.
6. Borrowing money against the cash value of life insurance policies if any are in existence.
7. Use of trade acceptances.

Employing Working Capital Effectively Through Pricing

So far we have considered how much working capital we are going to need on the basis of the volume of operations and have discussed how much of it will be fixed and how we should obtain it. Now let us assume we have the right amount from the right source and our company is in business. What precautions can we take to insure the safety of the funds. First, and most important, is to operate at a profit commensurate with the funds invested in the business. We can tell whether or not we are by keeping track of return on total

investment, obtained by multiplying the asset turnover by the profit ratio. If sales are $1,000,000, total assets employed $500,000 and net profits $50,000, the asset turnover is two times, profit ratio is five per cent and return on total investment is two times five per cent or ten per cent.

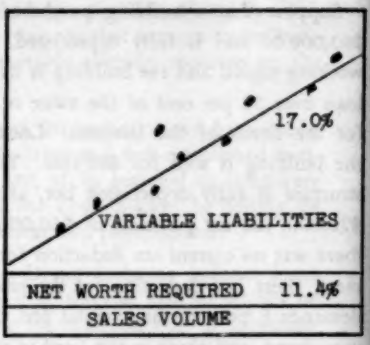

EXHIBIT 2

One of the surest ways of obtaining the proper return on total assets invested is to properly price the products one has to sell. This is important, especially for companies, which are leaders in their field. If the leader's pricing policy is not sound, then the small and medium sized business is usually priced out of the market and the big fellows fight it out among themselves. A way of determining a markup percentage is by computing the ratio of sales-related assets to sales and cost-related ones to costs, factoring both by the desired return on investment percentage, and dividing one plus the ratio to cost by one minus the ratio to sales (after adding to the latter a figure representing selling and general expenses.)

The following is illustrative:

(Sales equal $1,000,000)	Ratio to Sales	Ratio to Mfg. Cost
$ 50,000 Cash	.0500	
40,000 Accounts receivable	.0400	
49,300 Raw material inventory		.0833
49,300 Finished inventory		.0833
591,700 Plant and equipment		1.000
$780,300 Total assets		
Ratios	.0900	1.1666
19% (desired profit)	.0171	.2216
Add selling and other expenses budget to sales	.2600	
Total	.2771	.2216

$$\frac{1 \text{ Plus } .2216}{1 \text{ Minus } .2771} \text{ Equals } 1.69$$

On this basis in order to obtain a 19 per cent return on investment on any product or product line, the selling price has to be 1.69 times the cost of pro-

duction. To prove it let us take the case of an item which costs $5.00 to manufacture, a figure which, factored by 1.69, gives a selling price of $8.45. Supposing $1,000,000 sales (118,343 units) and the total asset and selling and general expense ratio also given above, the following figures result:

118,343 units times $8.45 equals	$1,000,000.00
118,343 units $5.00 cost	$ 591,715.00
Selling and administration expenses 26%	260,000.00
Total cost	$ 851,715.00
Net profit	$ 148,285.00
Total investment	780,300.00
Return on investment	19%

For those who want to be more scientific and who do not like to price all products on the basis of one markup on cost, because of the variance in material, labor and expense mix in the products, there is an alternative which represents pricing on a conversion cost basis. Assume that costs are broken down into fixed and variable elements and that, for a particular product, cost is:

Net sales	$20,400.00
Material cost	$ 8,000.00
Labor and expense	$ 6,000.00
Total cost	$14,000.00
Total assets employed	$32,000.00
Return on investment desired	20%
Ratio of sales to material cost	2.55
Ratio of labor and expense to material cost	.75

We are aiming at a 20 per cent return. We get it on material by a 10% markup or a figure of 110% of material cost if we assume that material turns over twice a year. Deducting 110% from the 255% ratio of sale to material cost and dividing the remainder by 75% ratio of labor and expense to material cost we get 193%. This is the markup we need on labor and expense to equal 20 per cent return on that portion of our product cost.

In short, if you determine the proper return for your business, based on your competitors or the best in your industry, and do as well or better, you are bound to preserve your working capital.

Generation of Capital for Expansion

Increased sales sought by most companies will bring a need for more capital, a matter not so universally attended to. Exhibit 2, drawn on the same basis as Exhibit 1 except that it relates to the liability side of the balance sheet, shows

that our variable liabilities are 17% of sales and that we need 11.4% of net worth to carry on our business and maintain our capital structure. Let us assume that our profit and loss statement shows a 25% contribution to profit and fixed charges before taxes. Let us assume a 50 per cent tax rate. That leaves us with 12.5 per cent contribution after taxes. Now, if we need 11.4 cents for each dollar of additional capital out of each additional dollar of sales, we are generating 1.1 cents of excess capital out of each dollar of expanded volume. Thus we can finance additional sales volume without the necessity of permanent or long-term borrowing. Of course, if our production period were six months or some longer period, we might have to resort to short-term borrowing for inventory and accounts receivable until such time as our capital had been generated, but we would not need new permanent capital.

On the other hand, if we were in a low margin industry and were generating only 5.4 per cent of capital on each dollar of sales and planned on expansion program to increase sales by $1,000,000, we would have to find an additional $60,000 of permanent working capital, beyond what would be generated out of our own sales volume.

Keeping Borrowed and Own Capital In Proportion

Determine the desirable ratio to have between borrowed capital and equity capital and stick with it. On it depends the solvency of the company. In the case of the need, cited above, for $60,000 of permanent capital in the business, how should this be raised? How much by stock, bonds, or long-term loans? In the long run, we must follow the ratios of our most successful competitors, or, at least, the ratios of the top three or four companies in our industry. If they are operating on the basis of 60 per cent equity capital and 40 per cent borrowed capital, we should try, insofar as possible, to keep our house in the beyond our control, such as the size of the company, its access to money markets, same order. Of course, sometimes our financial plans are limited by factors and security behind the expected borrowings.

Very few people realize what the total cost of borrowed money is. Let us take first the cost of borrowed money from institutional lenders. The going interest rate at which the money was borrowed is not all the cost. To this must be added the cost of underwriting, bond discount, if any, premium on redemption and most of all the average life of the bonds. For example, if $5,000,000 bond issue bears interest at 4 per cent and the cost of underwriting is $150,000, with a redemption price of 104, our cost is 2.45 per cent if the issue is in 20 years, 3.80 per cent in 10 years, and 5.00 per cent in 5 years.

Now, what is the cost of money from the stockholders? In a way this, too, is borrowed. This cost is a bit more difficult because one has to make certain assumptions based on potential earnings and dividends. If thirteen times a company earnings has been $65 ($5 a share earnings for the past few years), there has been a consistent policy of paying 50 per cent in dividends and book value is $50, the stock under ordinary condition would sell for $55, the average of these figures. If the company decides to borrow money by means of equity financing, it will have to earn 9.1 per cent after taxes, which is $5 divided by the $55 market price in order to maintain market price and not hurt the new stockholders.

With figures for the cost of institutional money and the cost of stockholders' money, we can determine the cost of any financing we want to do on any basis of borrowed capital to equity capital and management can prepare a plan for the raising of whatever funds are necessary in an orderly and sound manner:

1. All bonds, which might have a total cost of 4.5%, would have a cost after taxes of 2.25%.
2. All common stock would have a cost of 9.1%.
3. Half bonds and half common stock would yield a cost of 5.67%.

The main thing is to establish a ratio of borrowed capital to equity capital for your particular business which allows you to reduce your cost of borrowed capital or keep it at the present level and yet have financing costs which compare favorably with those in the industry. Then stay with this ratio; do not be guided too much by the tax picture or temporary savings to be made through financing with funded debt. In times of recession, interest and sinking fund charges have a way of making themselves the straw that breaks the camel's back.

Policy on Dividends, Insurance, Replacements Affects Capital

Make sure dividends are not being paid out of the capital of the stockholders. The rise in price level requires special attention to this. Just because dividends paid are not in excess of the earnings is no reason to feel that the capital of the company is not being impaired. The following calculations are illustrative:

DATA (*In M $*)			
Fixed assets	$10,000	Replacement cost	$20,000
Depreciation rate 5%.	500	Earnings after taxes..	1,400

Before tax profit	$2,800	Adjusted earnings	$2,300
Add back depreciation.	500	Less taxes paid	1,400
	$3,300	Earnings after taxes ...	$ 900
Less depreciation on replacement value ..	1,000	Dividends at 50%	450
		Dividends actually paid	700
Adjusted earnings .... (forward)	$2,300	Equity paid out in dividends	$ 250

Every business must have a complete insurance program to protect it from undue loss of its assets and profits. There should be key-man life insurance and a program for coverage of these risks:

1. Fire replacement value
2. Use and occupancy
3. Boiler
4. Fidelity
5. Public, Products and legal liability

There should be a sound policy on expenditures for capital additions. If you follow the return on total investment theory, you cannot go wrong. The most acceptable method of calculating the return on capital expenditures is the bankers repayment method. You solve for a missing factor, knowing:

Amount of investment	$40,000.00	Profit before depreciation ...	$10,000.00
Life of asset	10 years	Pay off period	4 years

If you have a table showing the present value of one dollar at compound interest, Exhibit 3, you can solve the rate of return you are going to get from

PRESENT VALUE OF 1 AT COMPOUND INTEREST

Period	21%	22%	23%	Period	21%	22%	23%
1	.826	.820	.813	11	4.177	4.035	3.902
2	1.509	1.492	1.474	12	4.278	4.127	3.985
3	2.074	2.042	2.011	13	4.362	4.203	4.053
4	2.540	2.494	2.448	14	4.432	4.265	4.108
5	2.926	2.864	2.803	15	4.489	4.315	4.153
6	3.245	3.167	3.092	16	4.536	4.357	4.189
7	3.508	3.416	3.327	17	4.576	4.391	4.219
8	3.726	3.619	3.518	18	4.608	4.419	4.243
9	3.905	3.786	3.673	19	4.635	4.442	4.263
10	4.054	3.923	3.799	20	4.657	4.460	4.279

EXHIBIT 3

the stated project. Just go down the years until you reach ten, which is the life of the asset, then cross the table until you reach a figure nearest to the 4 years pay off period. In this case we find that 21 per cent is 4.05 years and 22 per cent is 3.92 years, so we know the rate of return is in between these figures. Usually it is not necessary to go any further than this but, if you want to solve for the exact figure, you can use the following formula:

$$\frac{4.05 - 4.00}{4.05 - 3.92} = \frac{5}{13} \text{ times } 1\% = .4\%$$

Therefore, the rate of return is 21.0% plus .4% or 21.4%. The interest tables are available in stationery stores. An individual can work one out in a day's time with a slide rule.

The Utility of Position Forecasts

Management must be provided with financial forecasts of its operations. Current emphasis is on cost and expense budgets but equally needed, and more so from a capital administration viewpoint, are a cash forecast and a statement of sources and disposition of funds. The latter is, in essence, an analysis of the change between balance sheet accounts for the two periods involved in the forecast. In effect, it tells you what is going to happen to capital as a result of the decisions of management regarding sales, operations and certain financial transactions. Such a statement, based on the balance sheets shown in Exhibit 4, is as follows:

Sources of income:	
Depreciation	$ 50,000.00
Sale of long-term investments	100,000.00
Decrease in deferred charges	10,000.00
Net earnings	200,000.00
Total	$360,000.00
Sources of outgo:	
Fixed assets	100,000.00
Net increase	$260,000.00

A cash forecast is a more familiar matter and we will not spend much time on it. A short-cut method of making one is to start with the source and disposition of funds statement and continue on through the analysis of the

COMPARATIVE BALANCE SHEET		
	Present Period	Future Period
Cash	$ 50,000.00	$ 80,000.00
Accounts Receivable	100,000.00	70,000.00
Inventories	400,000.00	450,000.00
Total Current Assets	550,000.00	600,000.00
Fixed Assets	$ 500,000.00	$ 600,000.00
Depreciation	200,000.00	250,000.00
Net Sound Assets	$ 300,000.00	$ 350,000.00
Long Term Invest.	$ 200,000.00	$ 100,000.00
Deferred Charges	60,000.00	50,000.00
Total Assets	$1,110,000.00	$ 1,100,000.00
Accounts Payable	$ 200,000.00	$ 180,000.00
Accrued Expenses	100,000.00	110,000.00
Income Taxes	300,000.00	100,000.00
Total Current Liab.	$ 600,000.00	$ 390,000.00
Common Stock	$ 500,000.00	$ 500,000.00
Surplus	10,000.00	210,000.00
Total Liabilities	$ 1,100,000.00	$ 1,100,000.00

EXHIBIT 4

current assets and liabilities and arrive at the change in cash position. In our example, we would start with what we have and add the following:

Total income of sources already analyzed	$360,000.00
Decrease in accounts receivable	30,000.00
Increase in accrued expenses	10,000.00
Total	$400,000.00
Total outgo of sources already analyzed	$100,000.00
Increase in inventories	50,000.00
Decrease in accounts payable	20,000.00
Decrease in income taxes due	200,000.00
Total	$370,000.00
Increase in cash position	$ 30,000.00

Sundry Ways of Conserving or Increasing Capital

Make the most use of your cash flow. Some companies receive all their funds at one spot and then disburse them to various banks in different cities in relation to the needs of plants in those cities. Cutting down the float time of checks in transit will allow operations with less actual cash. In some companies, one or two days' float is quite a sum. This can be done by opening

accounts in important points in the larger cities or in a natural trade area. All monies within a certain radius are sent from the customer directly to a designated bank, reaching it for credit to the company two or three days earlier.

Inventory pricing methods also affect capital supply. The proper method will eventually reduce the amount of taxes you have to pay and that indirectly increases working capital. Taking full advantage of the depreciation methods allowed by the 1954 tax law will often result in obtaining working capital.

Care in administration of capital also requires that demands upon it be foreseen. Set up reserves to take care of all known contingencies. It is better to know what your financial position is going to be if the contingency happens than to go blindly along hoping it will not happen and then, when it does find that funds are not available. Under this particular heading come:

1. Future inventory losses
2. Possible law suits
3. Income taxes
4. Depreciation on replacement basis

With reference to the first two items, the reserves could be book reserves only, (unfunded) unless the amount is so large or the liability so nearly certain that it could cause financial embarrassment. Income tax reserves should always be funded by tax certificates or some other form of investment. Further, in my opinion, a cash policy is a good one to follow with reference to depreciation. I know of one large company which puts into an investment fund the amount of its depreciation each month plus a part of its earnings. All capital expenditures are charged to the fund. If there are not sufficient funds in the account to take care of an intended program, then some financing is arranged. Management knows what its problem is ahead of time.

Responsibility for Capital Supply

Normally capital maintenance is the treasurer's job because in most corporations he:

1. Supervises the cash position
2. Makes the banking arrangements and connections
3. Determines credit and collection policies
4. Has responsibility for insurance and taxes
5. Does long-term financing
6. Is responsible for forecasting
7. Has a hand in the dividend policy
8. Has contact with stock and bond holders

However, the majority of companies are not of the size which can have

treasurer's departments of this scope. Most of us operate in a middle stratum where everybody influences the working capital of the company, either directly or indirectly. Even in the larger companies the treasurer, while having the final responsibility, cannot do all things himself. He must delegate the responsibility to the:

1. Credit man
2. Tax department
3. Insurance department
4. Production department
5. Purchasing department
6. Accounting department

The creation and control of capital is not a one-man job. Just as capital filters through the entire needs of the business, so the responsibility for it rests with the entire management team, including the accountant. How well you serve management in its effort to make correct decisions will depend in a large measure on your understanding of the part capital plays in the continued operations of a business.

You *Do* Forecast Your Capital Needs

OLIVER R. CATHEY

If a friend of yours came to you and said, "John, I am going to start a manufacturing business and want you to help me determine how much and what kind of capital I need," you would start by asking a series of questions involving: (1) sales volume expected, (2) terms of sale, (3) gross profit margin, (4) floor space required, type of building, rented or owned, and value of property, (5) kind and cost of equipment needed for the product and normal life expectancy, (6) processing period, (7) relationship of material, labor and overhead in the product manufacturing cost, (8) method of distribution, (9) and other such data as needed to reasonably estimate the amount he would have tied up in receivables, inventories, current operating expenses, and fixed assets. The amount of capital he would need to operate his business would be the sum of these figures —and the figures you gave him would be just as accurate as the estimates he gave you.

Advanced determination of capital requirements of any business, large or small, requires estimates or forecast of future business volume expected. Whether you do it haphazardly in your own mind without being specifically conscious of it or whether you do it by elaborate and systematic budgets, you nevertheless make these forecasts, and govern your business activities accordingly. If capital requirements must be determined by such estimates, how then can we make these estimates with reasonable accuracy?

(*Continued on page* 92)

Order-Writing With Punched Tape and Cards

By RAY D. FINDLAY

OUR COMPANY IS A CORRUGATED paper box conversion plant purchasing paper board for each customer order and converting it to customer requirements. Job costs are gathered and accumulated on punched card tabulating equipment. Employment runs at an average of ninety persons. Incentive is applied on orders in the plant to the extent of an average seven hundred and fifty labor cards per day. Extensive use of punched card equipment was started two years ago and developed into a system correlating order writing, scheduling, payroll, voucher payments, invoicing, daily reports to salesmen and factory on status of material, gathering of job profits and losses by individual job, customer salesmen and product, and final financial statement to top management.

The Tabulating Installation in Its Initial Form

At the time of installation of the punched card system, an analysis of customers orders indicated that sixty five per cent (daily average) were repeat orders containing much constant information. Punching cards for one order meant an average of sixteen cards. However, it appeared that all variable information could be held in one card. On "repeats" only this would have to be produced. It also appeared that, if one card were produced, the invoice could be tabulated and could provide a summary punched accounts receivable file without further work.

The order form adopted consists of six copies: office, factory, billing memo, packing slip, delivery receipt, and customers acknowledgement. The office copy is used for ordering materials and for rating incentive standards on job cards. The factory copy is sent to the scheduling unit and, at the time the job is started, this copy is forwarded with the material for specifications on the various operations. When material moves to finished goods, the factory copy is forwarded to the shipping office, where the finished quantity is posted to shipping papers (billing memo), and then is forwarded to the office for use for the daily material status report. The billing memo, packing slip and delivery receipt are filed in with the quantity shipped and the billing memo is forwarded to office for invoicing, along with the packing slip furnished with shipment and

RAY D. FINDLAY is Office Manager and Assistant Treasurer of the Grand Rapids Container Co., Grand Rapids, Mich. He was previously Plant Accountant and Chief Cost Accountant of the Reynolds Metals Company's Grand Rapids Plant. Earlier, Mr. Findlay served as Controller of Expert Dye & Stamping Company of Grand Rapids.

delivery receipt signed by the customer and returned for filing. The customer acknowledgment is sent to the customer as soon as written. Information on all the above paper, is controlled through carbon "secret spots" and perforations.

The billing memo is put through the process of invoicing to the customer. Billing memos are extended on a desk calculator and control tapes taken on quantity and amount. Because bundles and pieces are independently calculated and the resulting quantity extended by price in a punched card calculator, the running of a proof sheet and balance to control tapes will proof all invoice amounts and quantities (if it were not for no charge items such as partitions and fillers billed on the container itself the balancing of amount would be sufficient proof). In the preparation of sales cards, the billing memos are used to pull manually from files the cards used for description and heading for the invoice. Manual insertion of the sales cards after proofing will put them into condition for running of the invoice. Because of machine controls on numbers used to identify these description cards and sales cards, the machine will misprint blocks in the invoice if the cards are not in proper sequence. Invoices are scanned as they are broken down from continuous forms and this is all the proofing necessary. The sales card is used to mechanically match material, labor, and cost information for punched card calculation of overhead and production of cards for use in reporting profit and loss by order, customer, etc.

I have given in the foregoing, a brief description of order writing and invoice writing system which accompanied the punch card installation. I have mentioned some of the advantages such as elimination of clerical work on order typing, elimination of a great deal of clerical work on the invoice preparation and the obtaining of better proof on invoices by machines, automatic preparation of accounts receivable and the availability of sales analysis. As to the last-named, the sales analysis card contains order number, product code and size, association code, general ledger account code, salesman code, customer code, and an identification number to tie into the description file. Statistics include square feet, quantity, amount, and a complete-or-balance-to-follow code. The sorting or collating of the card will, in very short time, provide a great deal of valuable information for top management. The disadvantages of the system are few. A large card file is required to carry order and invoice information (up to two hundred thousand cards). The fact that this size file cannot be mechanically used is a definite drawback.

Revised Procedure Relies on Tape Input and Output

A short time ago there was announced to the public a paper tape controlled typewriter with paper tape output and punched card output. An examination of

this machine with the idea of improving an already excellent system of order-writing resulted in a machine being ordered and changes planned in order writing and invoicing procedures. Our description of these will make up the remainder of this paper.

At the time a new item is needed to fill a customer order, the specifications and pricing are inserted on a heavy "master record." Other variable data are posted in space provided across the bottom of this master record, i.e., customer order number, our order number, dates of order and shipping schedule, quantity ordered, quantity stock needed, and price. In the past these master records have been forwarded for punching on a set of cards and have been assigned an identification number so that cards could be easily filed and pulled in connection with future orders and invoices. After punching, tabulator printing was the means of typing orders, with a summary punched sales card being part prepared. After the first order, the set of cards were pulled and one variable information card was inserted for tabulating orders.

The most significant change to be described occurs at the time the original order is instituted. In place of a set of cards filed by identification number, an output tape is prepared to be used in future order writing. This output tape is filed with the master record and will be immediately available at time of any future order writing. The identification number is no longer needed to tie a new order to the master record. The large file of cards, which seemed to be the only objectionable item in previous work, will no longer be needed and the manual filing is also eliminated.

Because of the elimination of cards carrying description for invoices, it is planned to punch a set of cards to carry description and sales information to the invoice. All invoice card operations now will be mechanical in calculating, placing in order, and typing the invoice. Each set of descriptions and sales cards (average three cards) will be identified by order number and used only on that order. Because a card is available from status of material operations, with order number, bundles and pieces previously punched, the collating of this card and full set of invoice cards is possible with the subsequent mechanical calculating, sorting, proofing, and invoice tabulating being handled by machine. This again eliminated the manual pulling, placing in correct sequence, and filing operations. This saving of manual operations will improve the invoice writing process without loss of any of the advantages previously enjoyed.

A flow chart for comparison of present and planned systems, not given here, was prepared in some detail. Because the maximum elimination of manual operation occurs after the first writing of orders, the flow chart was prepared on the basis of second or subsequent writings of the order. It was cut in some

places where operations were the same in present and proposed systems.

Advantages, of the revised procedure, not mentioned previously, are immediately available rush orders (not delayed by batch running on tabulating equipment), elimination of periodic cleaning of obsolete items from card files, etc. Forms have been simplified for order writing because of alphabetic restrictions on tabulator. A smoother flow of orders and a better, more mechanical handling of invoice writing is expected. Not until the paper tape output, input, and card punch connection was available could the proposed system be effective. The company is looking forward to completion of the proposed system. Machines will be delivered in the summer of 1957 and will be in full operation thirty days after arrival.

(*Continued from page* 88)

In an established business it is somewhat easier than in a new venture because you have past experience to guide you but, in either case, it involves constant study of the market, business indexes and factors affecting your own particular situation.

Each industry has certain factors to guide it. For example, we find that elevator business is geared somewhat to the volume of engineering and construction as disclosed in published statistics, with a time lag of almost a year. In the auto-lift business, we have found that filling station construction is a good base and that this follows reasonably close to the new automobile sales curve.

Sales forecasting is the start. From there you must go on to capital asset requirements, proper kind of capital structure, etc. Good planning is essential to good management. It starts with forecasting.

Beyond These Covers

Books

Budgeting: Profit-Planning and Control

Glen A. Welsch, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1957, 487 pp., $10.60.

A full-scale presentation of budgeting, with emphasis on its use in helping management exercise effective control over operations, this text was written for executives and accountants, as well as students. The table of contents is so constructed that illustrations are easily found in relationship to text. Cost-volume-profit analysis and variance analysis are specifically treated. The author has been a contributor to the *Bulletin.*

Accounting Principles

Howard S. Noble and Rollin Niswonger, South-Western Publishing Company, Cincinnati, Ohio, 1957, Seventh Edition, 742 pp. $6.

An introductory text intended for students planning to major in accounting or related areas, the present work introduces the accounting cycle through the example of a service and then a trading enterprise, reserving the accounting problems of manufacturing for mid-course or later. It may be noted that Part I of the book deals with accounting statements in their character of reports, thus emphasizing the end-products of accounting. This treatment is reinforced by further consideration at the close under the part heading of "Using Accounting Information."

The Renegotiation Guide

Vincent P. Callahan and Fredrick Hollowell, Editors, Renegotiation & Termination Letter, 1420 New York Ave., N. W. Washington 5, D. C. Paper Bound, 1957, 202 pp., $25.

Subtitled "Sourcebook of Information and Advice" and "Basic Guide on Renegotiation for Defense Contractors and Subcontractors," this manual-type publication seeks "to make available—as one complete kit of tools—all of the important—material on renegotiation produced since the Renegotiation Act of 1951." Its approximately forty chapters are, in general, separately authored. Company methods in reporting under renegotiation are exemplified and Renegotiation Board procedures are treated from a variety of angles, including reproduction of statements of a past chairman and a past director of accounting of the Board.

Better Wage Incentives

Phil Carroll, McGraw-Hill Book Company, Inc., 330 West 42nd St., N. Y. 36, N. Y., 1957, 230 pp., $4.75.

The well-known management engineer who writes this book is anxious that wage incentive plans should work, both for the company and the employee. This is the theme which runs from "Why so many grievances?" the title of the first chapter to "The bigger pie to divide," which is the title of the last. Containing many examples, the text is entertainingly written. Incentives for indirect labor are recommended. A "laboratory" chapter is "Starting the Incentive in Your First Department."

Company Severance Pay Plans

George H. Haas and Elizabeth R. Floyd, American Management Association, Inc., 1515 Broadway, New York 36, N. Y. 1957, Pamphlet, 47 pp., $1.00 to members, $1.50 to nonmembers.

This is study of practice based upon "250 questionaires distributed to companies selected at random." It summarizes the 119 responses received, of which 53 indicated "some type of severance payment." The text describes and particularizes findings.

Some Arguments Against Inter-Period Allocations of Income Taxes

Thomas M. Hill, Accounting Review, July 1957.

It is part of the author's case that allocation of income tax among periods, when it is undertaken, must proceed on heavily subjective considerations. For this and other reasons, its desirability is questioned.

The Significance of the Concept of the Corporation in Accounting Analyses

Robert T. Sprouse, Accounting Review, July 1957.

Considered here are accounting and other implications of four concepts of the corporation, i.e., as an association of shareholders, an entity operating for the long-term equity holders, a social institution, and a "prescribed set of legal relations."

Depreciation—Better Left Unsaid

Frank A. Singer, Accounting Review, July 1957.

A meaning of amortization "which includes that which accountants do when they say depreciate" is found by the present author with the suggestion that the word should be used in every situation in which it applies.

The Gulses of Replacement Cost

John W. Coughlan, Accounting Review, July 1957.

Dealt with here are the emergence and relationship of current cost basis accounting for costs related to inventories and fixed assets, largely against a tax background.

Bringing Break-Even Analysis Techniques Up to Date

Henry K. Klopstock, Business Budgeting, June 1957.

Attention to the behavior of semi-variable costs and to break-even analysis as affected by product mix is given in this paper, which suggests also the company operating situations in which this type of analysis is significant.

Cost Controls for That Dream of A Life-Time—A New Office Building

Robert L. McCafery, Business Budgeting, June 1957.

With its theme well disclosed by its title, this article delves down to the particulars and phases (including time phases) at which a control-minded accountant can be exceptionally useful to his company when an office building is being planned and while it is being erected.

Control by Budget

James L. Peirce, Controller, July 1957.

The process of budgeting is considered in this paper pretty much as an independent technique in the controller's armory of weapons and is dealt both philosophically and procedurally.

Economics of Equipment Leasing

Charles Mr. White, Jr., Controller, July 1957.

Pertinent to the current greater prominence of the leasing alternative to the users of office, automotive, and productive equipment, the coverage of this article is that of distinguishing types of lease arrangements and identifying advantages and disadvantages in leasing.

Purchasing for Profit

Herbert J. Richmond, Controller, July 1957.

Determining the profitability of a function is usually a riddle but making it more profitable is generally a distinct possibility. Among the avenues to this, noted by the author of this article on purchasing, are control of order quantities and delivery and control of storage and of vendor relationships.

Expanding the Supply of Machine Accountants

Donald L. Gerighty, Controller, July 1957.

As stated at the start of this article, projection of machine accountant requirements to 1960 and beyond must consider that there were 10,000 such accountants in 1947, 20,000 in 1952 and perhaps 35,000 now. A good part of the paper relates to the activities of the association specializing in this field.

The Finance People

A. A. Buzzi, Controller, July 1957.

Progress of financial staff in the scheme of things from police functions to policy functions is explored in this article, with emphasis on the use of analytical talents and a forward view in planning.

The Economics of Management

Calvin C. Potter, Cost and Management, June 1957.

There is a reminder here that all businesses are operating within a market. It is noted as possible to alter the structure of the market or to switch markets (or perhaps the change will be forced from the outside) and that there are valid cost considerations involved.

Planning Organization for Cost Control

William H. Hopkins, Cost and Management, June 1957.

Such elements of relationship within a company as motivation, communications, methods, layout of facilities, and scheduling are, to the writer of this article, essential elements in achieving control.

New Technique for Intra-Company Pricing

Paul W. Cook, Jr., Harvard Business Review, July-August 1957.

It will not come as a surprise to readers that the author of this extensive article is concerned with overhead in intra-company pricing, lest it always obscure the profit situation. A recommendation is made for "communicating variable cost information on intra-departmental vouchers."

Comparing Pension Costs

Henry W. Otis, Harvard Business Review, July-August 1957.

A well-reasoned article, this presentation suggests that insured pension plans may be more reliable and trusteed plans more flexible and goes into the extent and significance of these advantages.

High Speed Operations Research

Melvin E. Salveson, Harvard Business Review, July-August 1957.

Some may object that high-speed operations research is something to consider only after they have a little comprehension of this newly developed statistical-mathematical-management team concept at lower velocities. However, the accelerated form is here presented as relevant to solving highly relevant planning problems.

Profitability Index for Investments

Ray I. Reul, Harvard Business Review, July-August 1957.

What facilities should be acquired, when, for what products, and under what cost control? A way of answering these timely questions is given here with extensive illustrations of methods.

Addresses of Periodicals

Accounting Review
Carson Cox, Ohio State University, Columbus 10, Ohio. Single copy $1.50.

Business Budgeting
National Association for Business Budgeting, Covington, Kentucky.

The Controller
The Controllership Foundation, 2 Park Avenue, New York 16, N. Y. Single copy, 50¢.

Cost and Management
31 Walnut St., So., Hamilton, Ontario, Canada. Single copy, 50¢.

Harvard Business Review
Soldiers Field Station, Boston 63, Massachusetts. Single copy, $1.50.